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Canon

CAMERA MANUAL

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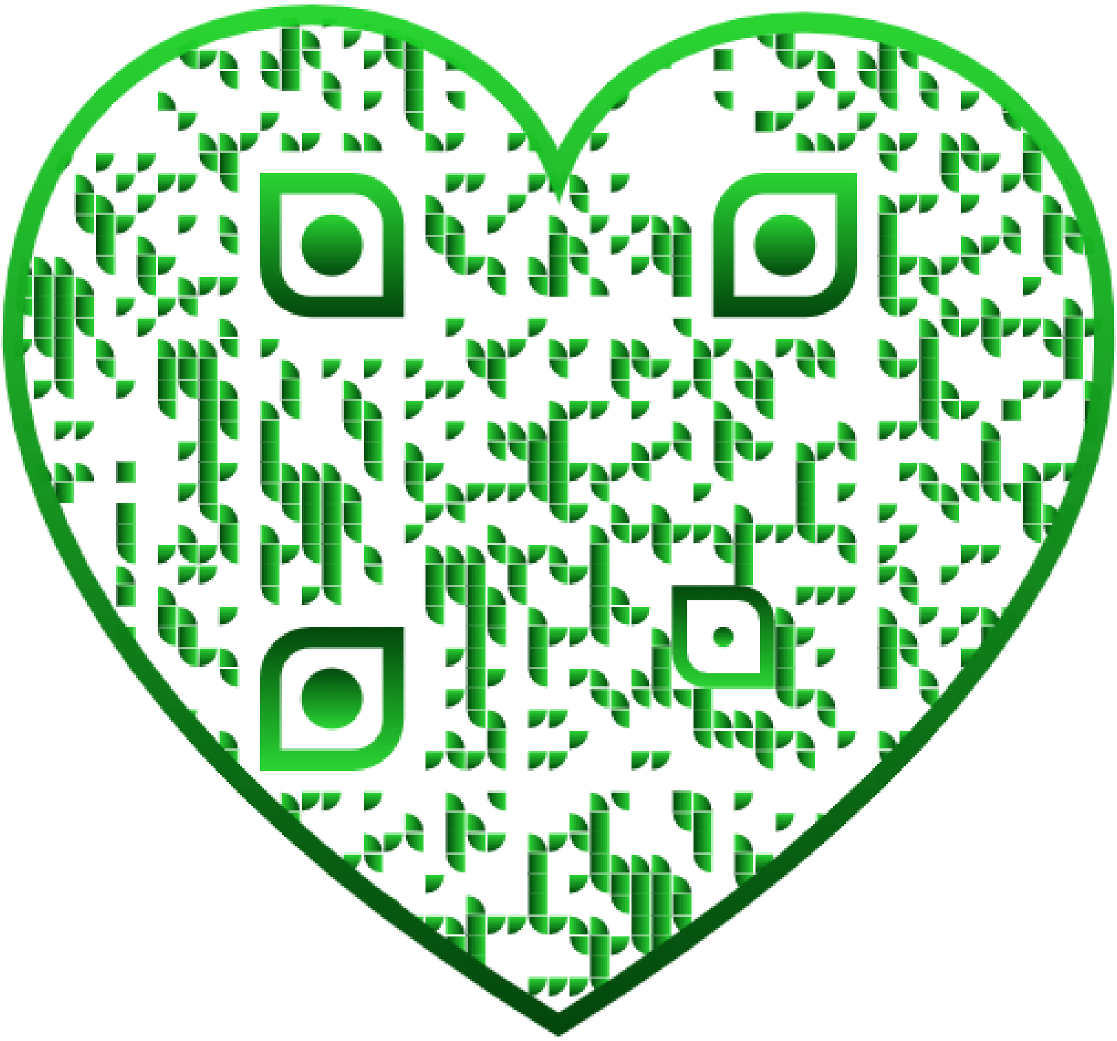

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Papercut's

Canon

CAMERA MANUAL

Discover how to get the best from your Canon Camera! For amateur and professional alike, the Canon EOS range gives you the ability to tell your story and express your creativity through the power of the image. Digital cameras have exploded in popularity in recent years and the level of innovation and technical advancement at the photographer's disposal is beyond compare. The range of equipment available within the EOS system is vast, which can be overwhelming if you are new to Canon. The aim is simple: we want to help guide you so you can make the best informed choice about which camera, lens or accessory is right for you. Moreover, we want to show you a number of projects that were all undertaken with Canon equipment, so you can better understand how to get the absolute best out of your gear. Whether you are just looking to improve your holiday snaps, develop more skills as a creative photographer or searching for some interesting wet weather projects, we have something for everyone.

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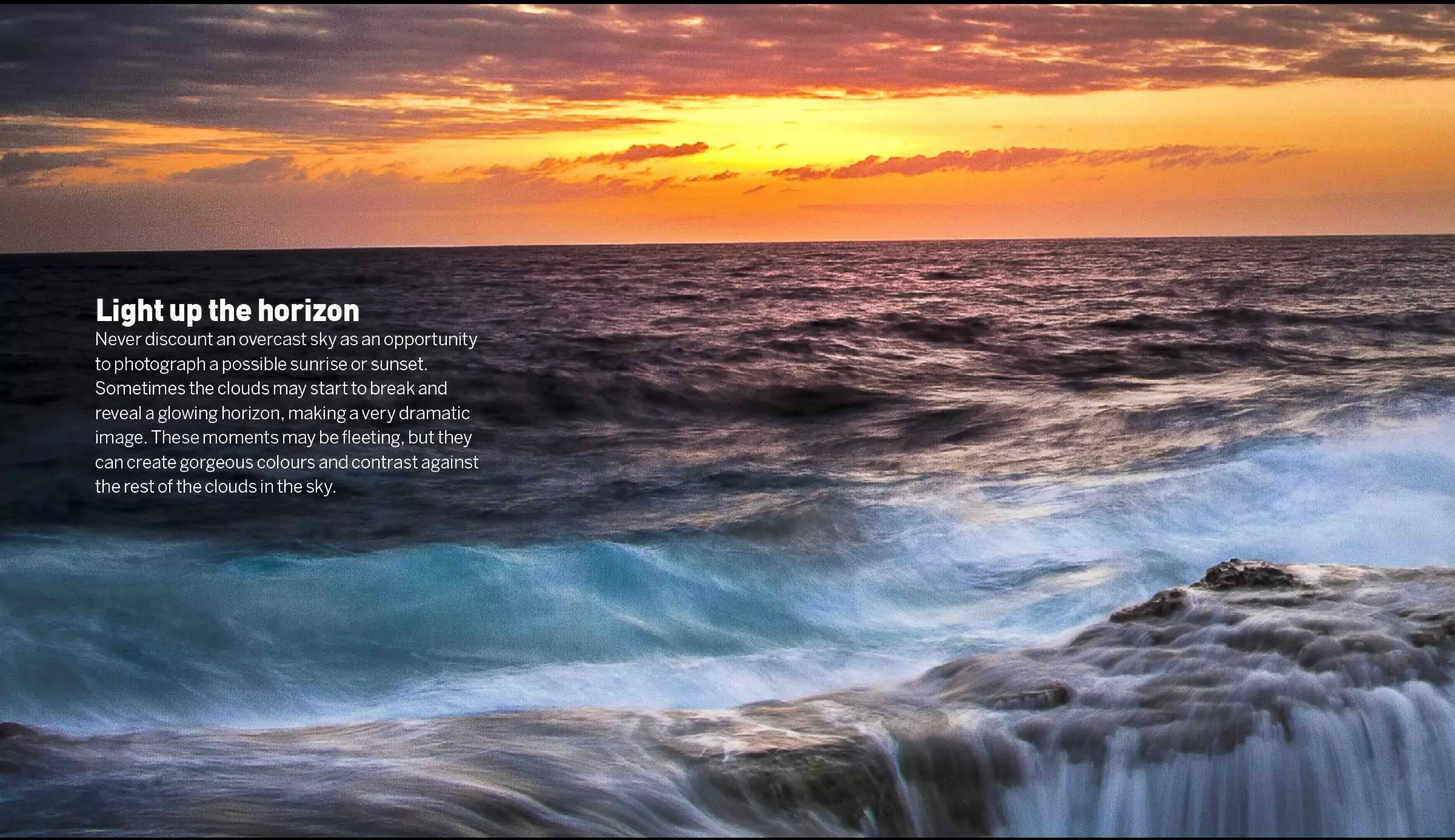
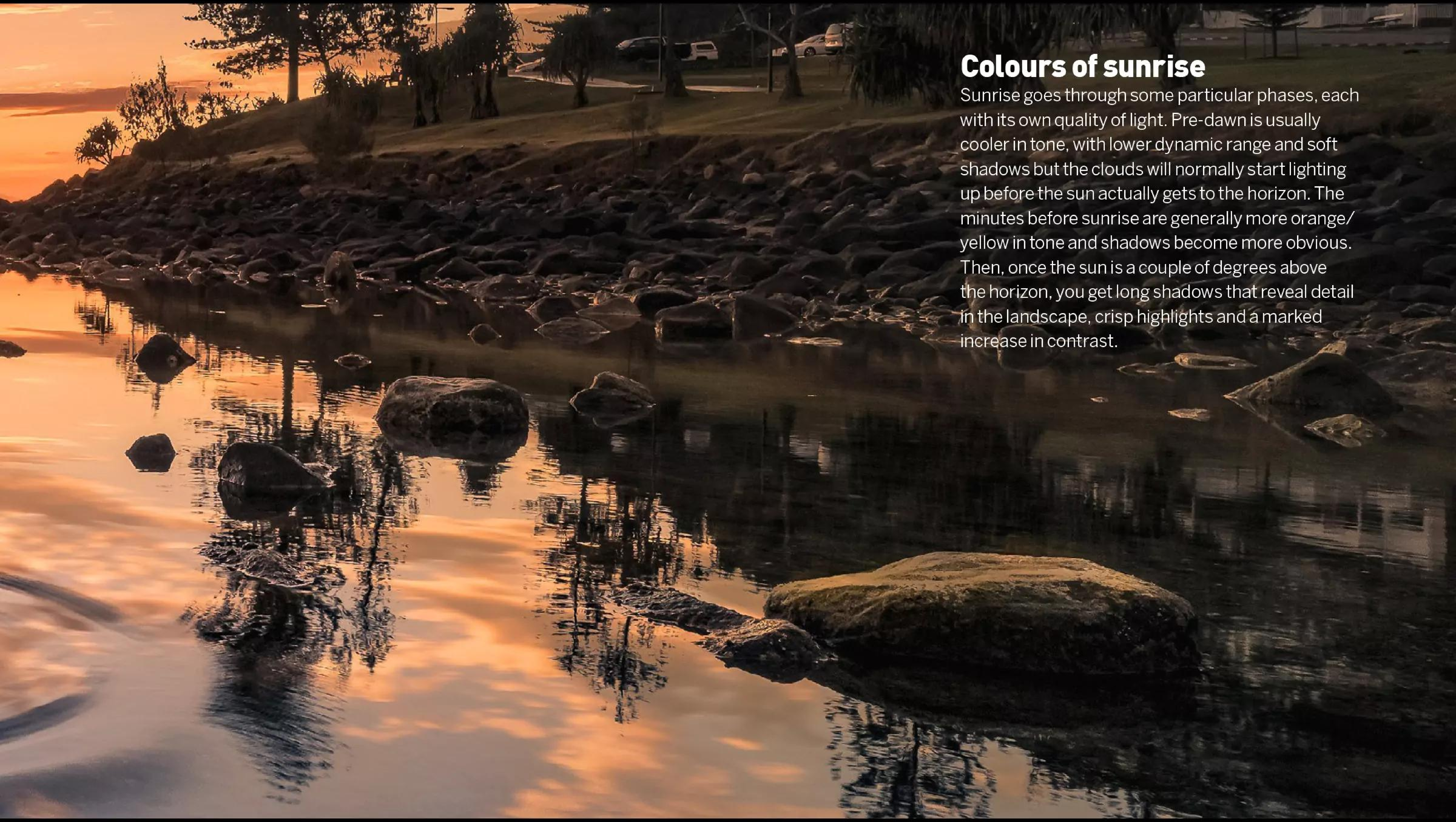


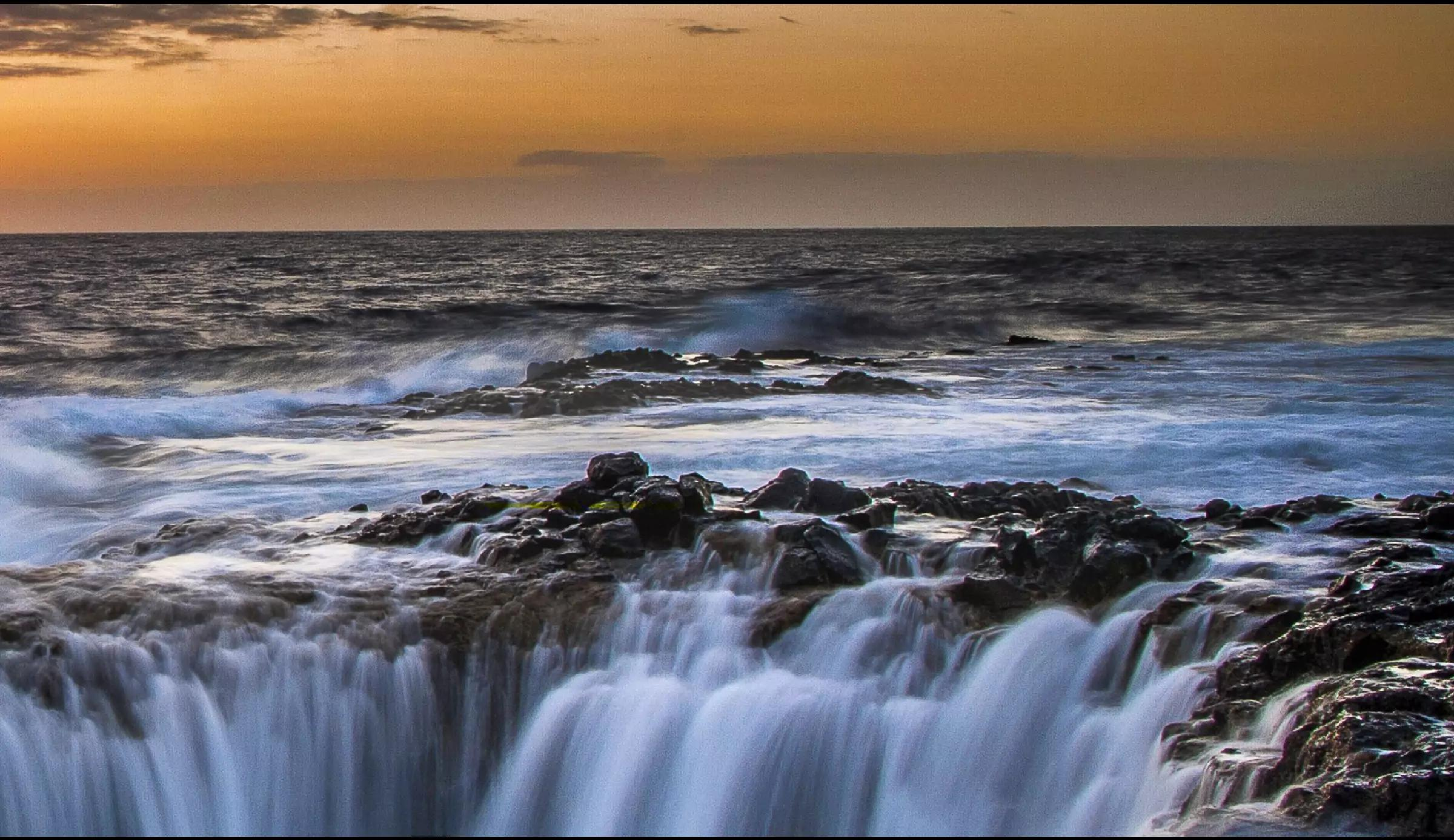
Light up the horizon

Never discount an overcast sky as an opportunity to photograph a possible sunrise or sunset. Sometimes the clouds may start to break and reveal a glowing horizon, making a very dramatic image. These moments may be fleeting, but they can create gorgeous colours and contrast against the rest of the clouds in the sky.



Colours of sunrise

Sunrise goes through some particular phases, each with its own quality of light. Pre-dawn is usually cooler in tone, with lower dynamic range and soft shadows but the clouds will normally start lighting up before the sun actually gets to the horizon. The minutes before sunrise are generally more orange/yellow in tone and shadows become more obvious. Then, once the sun is a couple of degrees above the horizon, you get long shadows that reveal detail in the landscape, crisp highlights and a marked increase in contrast.



CANON GEAR GUIDE

Your essential guide to Canon cameras and equipment

Whether you are a beginner, an enthusiast or a seasoned professional, Canon's range of cameras and accessories means that there is something for everyone. From stylish compact cameras, to entry level DSLRs and top of the range professional equipment; the range available to choose from is huge. Over the following pages we'll take a look at the primary Canon range with easy at a glance specifications to help you decide which type of camera is right for you, along with some pros and cons to help refine your choices.

We start with a few choice compact cameras and then move on to more advanced models such as the EOS M range and APS-C crop sensor and full-frame DSLRs. We also have a breakdown of lenses for EOS M, crop-sensor and full-frame camera bodies, as well as the range of Speedlites available to bring light and creativity to your shots.

Photography is all about how you capture light. With a Canon camera, you have the chance to produce powerful and beautiful images. You also have a gateway to fun and creativity, and it begins here.■

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EOS
90D
Canon
EFS 18-135mm
AF MF
STABILIZER ON OFF

Anatomy of a DSLR

What goes on at the front of a Canon DSLR?

If you're serious about your photography then sooner or later you're going to want a digital SLR. Despite all the improvements in advanced compact, super-zoom or compact system camera design, in terms of image quality, performance and creative versatility the digital SLR still beats almost every other type of camera hands down. There are some top-end pro cameras costing tens of thousands of pounds which can take better pictures, but frankly if you're considering one of those then you're reading the wrong book.

The acronym "SLR" stands for "single lens reflex". The "single lens" part is to differentiate them from the twin-lens cameras that were popular in the 1960s, while the "reflex" part refers to the reflex mirror, an angled movable mirror that sits in front of the sensor and directs incoming light to the camera's viewfinder. The mirror moves out of the way when a picture is taken, making that distinctive "click-clack" noise.

Only a few years ago digital SLRs were the exclusive preserve of wealthy enthusiasts and top professionals, but thanks to keen competition between the manufacturers and increasing popularity, the price of entry-level DSLRs has tumbled and it is now possible to buy a good basic digital SLR complete with a standard zoom lens without breaking the bank, and even mid-range models are under £600 body-only.

The very top professional DSLRs such as the Canon EOS-1DX Mark II still cost thousands, but then we've all got to have something to aspire to, haven't we? ■

Canon
EOS
5D
Mark II
CANON EF LENS
24mm 1:1.4 L
Φ 77mm

The Canon EOS 5D Mk II was one of the most successful DSLR cameras of recent years. See opposite to find out what goes on inside!

1 Reflex mirror

The reflex mirror is what gives the Single-Lens Reflex (SLR) camera its name. Light coming in via the lens is split by this mirror, with most going upwards into the viewfinder, while a smaller proportion is allowed through a central part-silvered area and directed to the autofocus system. The reflex mirror flips up out of the light path when the shutter is triggered, producing that distinctive "click-clack" sound that all SLRs make.

2 Sensor

This is the picture-taking element at the heart of the camera. It consists of a wafer of silicon embedded with millions of tiny photocells that produce electrical charge when exposed to light. The sensor in this Canon EOS 5D Mk II measures 36 x 24mm (the same as a frame of 35mm film) and has 21,100,000 individual photocells.

3 Image processor

The electronic circuitry inside the camera takes the individual charge signals from the photocells on the sensor and converts them into a digital image. Modern advanced processors such as the Canon DIGIC 4 in this EOS 5D Mk II are amazingly fast, and also apply sophisticated noise reduction algorithms.

4 Focusing screen

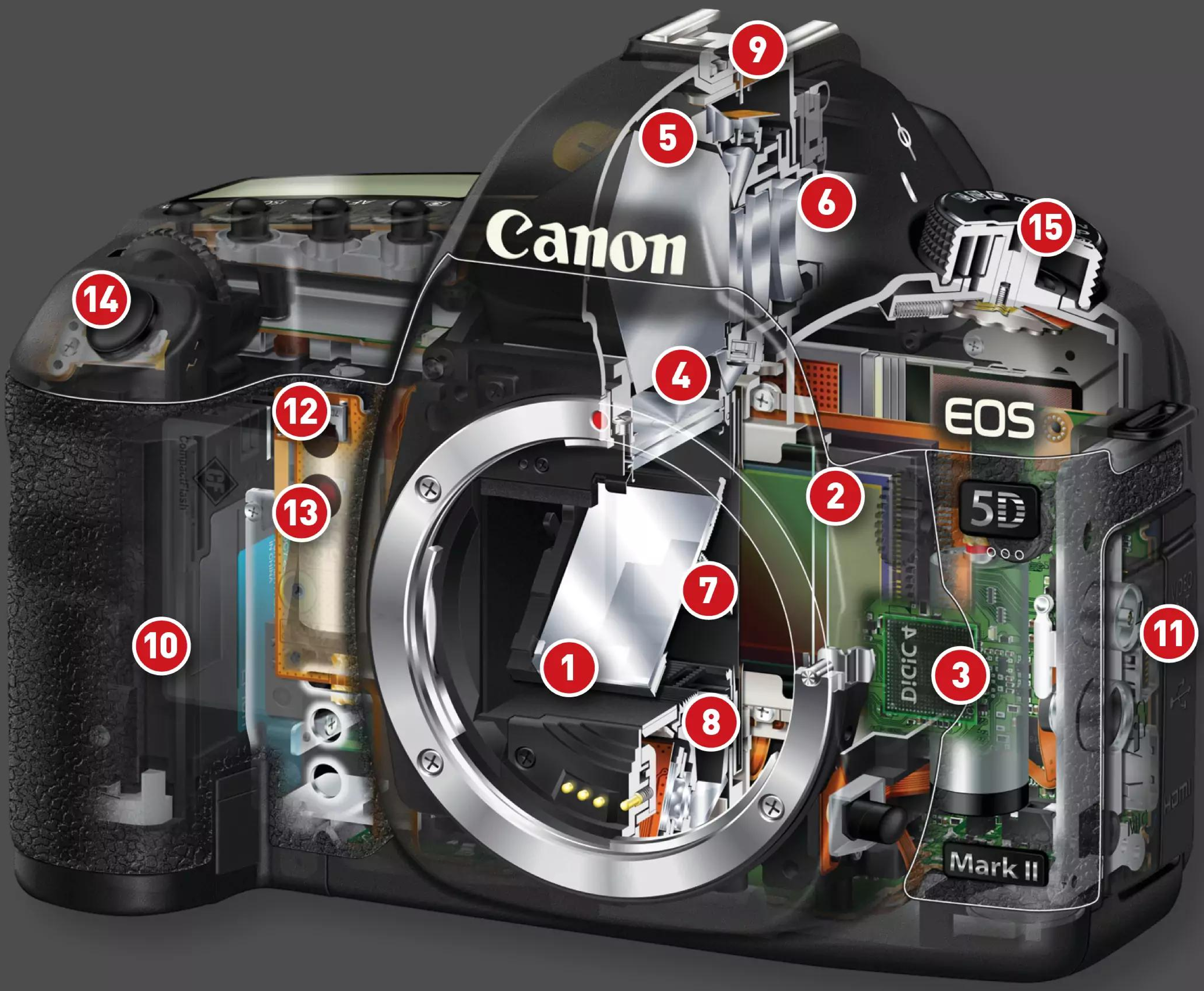
This consists of a ground-glass screen onto which the image seen by the lens is reflected via the reflex mirror. On advanced DSLRs such as this EOS 5D Mk II the focusing screen can be changed for one with grid lines or targeting reticules for specialist applications such as forensic or architectural photography.

5 Pentaprism

This takes the light from the focusing screen and bends it through 90 degrees, directing it into the viewfinder eyepiece. Some cameras have a mirror in this position instead. It is the position of the pentaprism that gives SLRs their distinctive shape.

6 Viewfinder

The defining characteristic of an SLR camera is an optical viewfinder that shows the view through the lens (TTL). Data such as focus points and exposure information are also shown in the viewfinder on a separate LED display. Optical viewfinders are generally considered to be superior to electronic ones.



7 Autofocus mirror

An area in the middle of the reflex mirror is partially transparent, allowing some light through onto a second mirror. This directs some of the incoming light downwards onto the autofocus sensor. This mirror also folds up out of the way when a shot is taken.

8 Autofocus sensor

Some of the light coming in via the lens is directed onto the autofocus sensor. Digital SLRs use a type of autofocus called "phase detection", which is inherently better and faster than the "contrast detection" systems used in compact and super-zoom cameras.

9 Light meter system

Some of the light directed towards the viewfinder is diverted to the light metering system. Modern digital SLRs have sophisticated multi-point light meters that can rapidly analyse a scene and calculate the exposure setting.

10 Battery

Digital SLRs are powered by larger, higher-capacity batteries than most other types of camera. Since the monitor screen isn't in constant use, this gives most DSLRs excellent battery duration, a vital feature if you are using the camera in a professional capacity.

11 Connectivity

Modern cameras have a wide range of connectivity options. This Canon EOS 5D Mk II features USB 2.0 and HDMI as well as a dedicated composite video output connector, all hidden under a weatherproof rubber hatch.

12 IR remote sensor

Most digital SLRs have an optional infra-red remote control for long-range shutter release, much more convenient than the old cable or bulb release gadgets.

13 Self-timer indicator

Even a pro camera like the 5D Mk II can be used for family shots. The LED indicator blinks to mark the countdown for a self-timer shot.

14 Shutter button

Most digital SLRs incorporate a chunky handgrip, usually with the shutter button and adjustment wheel located on the top or front. As with compact cameras a half-press of the shutter button activates the metering and AF systems. DSLR shutters are designed to be used hundreds of thousands of times.

15 External controls

Cameras intended for professional use are built to a more exacting standard, and incorporate weatherproof environmental seals on all the hatches and controls, keeping out dust and moisture.

Anatomy of a DSLR

What goes on at the back of a Canon DSLR?

All DSLRs have a full range of manual functions, and generally have a much wider range of control than even the best super-zooms or advanced compact cameras. DSLR sensors range from 12 megapixels up to over 25 megapixels, and are physically larger than the sensors in compact and bridge cameras, giving them a number of advantages in terms of image quality.

The majority of Canon digital SLRs use a sensor size known as APS-C, roughly half the size of a frame of 35mm film. They are typically around 24 x 16mm, while the advanced professional DSLRs use 'full-frame' sensors. These are the same size as a frame of 35mm film.

All Canon digital SLRs have interchangeable lenses and a wide range of accessories, such as external flashguns, extra battery packs, Wi-Fi transmitters and other gadgets. ■

Canon
EOS 1200D
CANON ZOOM LENS EF-S 18-55mm 1:3.5-5.6 IS II
φ58mm

The Canon EOS 1200D (US Rebel T5, Japan Kiss X70) is an 18mp camera that utilises the APS-C sized sensor with great image quality in an affordable package.

1 Monitor screen

Since DSLRs have optical viewfinders, the monitor screen is used mainly for menu functions and image playback. However most recent digital SLRs do have the option of live monitor view, very useful for shooting at awkward angles when you can't use the viewfinder. Most digital SLR monitors are very large, typically 3.5 inches with a resolution of at least 430,000 dots.

2 Viewfinder eyepiece

The eyepiece is cushioned and protected by a soft rubber frame which can be removed to make room for accessories such as an eyepiece cover or a magnifying finder.

3 Viewfinder optical correction

Most DSLR viewfinders include manual optical adjustment to compensate for long or short-sightedness, so that you can use your camera without needing to wear your glasses.

4 Flash hot-shoe

All digital SLRs have a hot-shoe for mounting an external flashgun. The contacts in the shoe provide a switch to synchronise the flash with the camera's shutter, but more sophisticated flashguns usually from the same brand as the camera can use extra contacts to link up with the camera's exposure metering system, to ensure perfectly exposed flash shots.

5 Pop-up flash

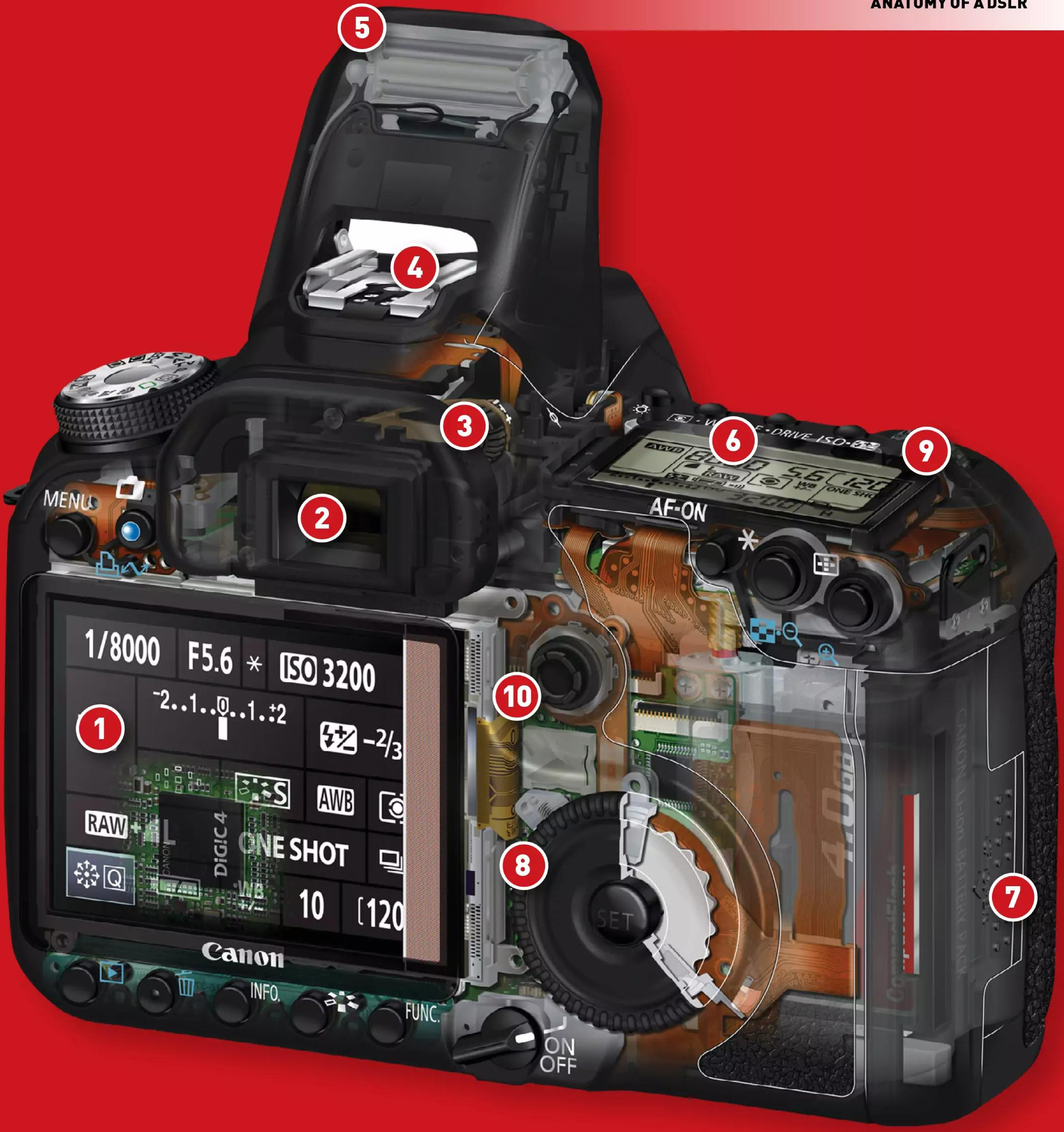
Most entry-level and mid-range digital SLRs have a pop-up flash mounted above the pentaprism. These are usually relatively weak, with a maximum range of only a few metres, and are no substitute for a good external flashgun, but they are useful as a fill-in light for backlit portraits.

6 LCD display

Most top-end DSLR models have a separate LCD data display showing things like exposure information, camera settings, remaining storage capacity and battery duration. They are usually back-lit so you can read them in the dark.

7 Memory card slot

While a few years ago most DSLRs used CompactFlash memory cards, these days the vast majority use SD cards for storage. They are smaller, lighter and cheaper, and in some cases faster too.



8 External controls

Digital SLRs have a much wider range of controls than even advanced compact cameras and the function of many of them can be customised to suit the user. On this Canon EOS 50D mid-range DSLR the exposure is adjusted via this large rear dial and the smaller roller wheel on the top of the handgrip.

9 Adjustment wheel

Most digital SLRs will have one or two of these, usually positioned within easy reach of the right thumb and forefinger. They are used for adjusting exposure values and some numerical exposure settings.

10 Menu control

Most digital SLRs, and particularly the more advanced models, have extensive and comprehensive menu interfaces, with many screens of customisable options and adjustments. Most have a dedicated menu navigation control, either a D-pad or, in the case of this EOS 50D, a small joystick.

Digital compact cameras

The next level of simplicity, shooting and sharing

If you seek something easy to use but still powerful, sleek and stylish, then Canon's range of compact cameras is where you can find your perfect device. Canon's innovative technologies are the backbone of the PowerShot and IXUS range of compact digital cameras that take you to the next level of shooting and sharing beautiful photos and HD quality movies.

From the ultra-compact, to the versatile and affordable, you will no doubt find something that suits your pocket and your lifestyle. Here is just a sample of the digital compact camera range, that will get you inspired and ready to share your precious memories. ■

CANON ZOOM LENS 4.2x IS
8.8-36.8mm 1:1.8-2.8
G7X

Canon PowerShot G7 X III

£699/$749/€766

A smart and small, multimedia compact.

Canon
CANON ZOOM LENS 4.2x IS
8.8-36.8mm 1:1.8-2.8
G7X

- 1.0-type stacked sensor
- 20.1MP effective pixels
- DIGIC 8 image processor
- 4.2X zoom lens
- RAW burst mode 30fps
- Bluetooth & Wi-Fi connectivity
- 4K movie
- 120fps high frame rate movie
- Vertical movie
- 3.0 inch LCD touchscreen

Pros: A nice, responsive touchscreen. Good handling and build quality.

Cons: AF system is a bit outdated. No viewfinder built in. No hot-shoe.

★★⯪☆☆ 2.5

Canon PowerShot G5 X II

£800/$899/€805

All the power and portability you need in a camera.

Canon
CANON ZOOM LENS 5x IS
TOP PICK

- 1.0-type stacked sensor
- 20.1MP effective pixels
- DIGIC 8 image processor
- Superb 5x zoom lens
- Fast f/1.8-2.8 aperture
- Pop-up electronic viewfinder
- 4K movie
- 120fps high frame rate movie
- Bluetooth & Wi-Fi connectivity

Pros: Great overall image quality. Well made. Responsive handling.

Cons: Battery life is sub par. Soft lens wide open. Quite expensive.

★★★★⯪ 4.5

Canon PowerShot G1 X III

£1149/$1099/€1210

Premium quality and expert control.

- APS-C CMOS sensor
- 24.2MP effective pixels
- DIGIC 7 image processor
- 15-45mm f/2.8 - f/5.6 zoom lens
- 3x optical zoom
- 6x ZoomPlus
- 49-point AF system
- 2,360,000 dot OLED EVF
- 7.5cm vary-angle LCD touchscreen

Pros: Great image quality. Intuitive control layout. Weather sealing.
Cons: No 4K video capability. Battery does not last. Limited lens.

★★★★⯪ 4.5

Canon PowerShot G3 X

£649/$849/€819

Large sensor camera for great quality images.

Canon
CANON ZOOM LENS 25x IS
G3 X

- Large 1.0-type sensor
- 20.2 MP CMOS with 3:2 aspect
- f/2.8 - f/5.6 maximum aperture
- DIGIC 6 processor with iSAPS
- 25x optical zoom
- 50x digital zoom
- 31-point AF system
- Full HD 1080p movies
- Quick-bright LCD touchscreen

Pros: Versatile zoom range. Good build quality. Great image quality.
Cons: Could use an electronic viewfinder. Raw performance needs improvement.

★★★★⯪ 4.5

Canon PowerShot SX740 HS

£399/$399/€3990

Compact travel zoom flagship camera.

Canon
40x OPTICAL ZOOM
SX740 HS

- 1/2.3 back-illuminated CMOS
- 20.3MP effective pixels
- DIGIC 8 image processor
- 4.3-172mm zoom lens
- 40x optical zoom
- 80x ZoomPlus
- f/3.3 - f/6.9 maximum aperture
- 3.5-stop image stabilisation
- 7.5cm 922,000 dot LCD

Pros: Large 40x optical zoom. Accurate autofocus. 4K video capability.
Cons: Not so good in low light. No Raw facility. Screen not touch sensitive.

★★★★☆ 4.0

Canon PowerShot SX620 HS

£192/$249/€199

A great travel companion.

Canon
25x OPTICAL ZOOM
SX620 HS

- 20.2 MP back illuminated CMOS
- Great for low-light shots
- DIGIC 4+ processor with iSAPS
- f/3.2 - f/6.6 maximum aperture
- Up to 405 shot battery life
- HD movie recording at 30fps
- 25mm wide angle lens
- 25x optical zoom
- Smartphone remote control

Pros: Built in Wireless. Image stabilisation. High resolution sensor.
Cons: No vari-angle screen. Only 9 AF points. No Raw shooting capability.

★★★★☆ 4.0

Canon PowerShot SX60 HS

£329/$340/€372

Amazing zoom range bridge camera.

Canon
SX 60 HS

- 16.1 MP CMOS sensor
- 65x optical zoom
- 21-1365mm zoom range
- 130x digital zoom
- Maximum aperture f/3.4 - f/6.5
- 3.0 inch vari-angle screen
- Wi-Fi and NFC built in
- Electronic viewfinder
- Full HD 1080p at 60fps

Pros: Great image quality. Intuitive control layout. Weather sealing.
Cons: No 4K video capability. Battery does not last. Limited lens.

★★★★☆ 4.0

Canon PowerShot SX540 HS

£240/$349/€288

Small sensor super zoom camera.

Canon
CANON ZOOM LENS 50x IS
SX 540 HS

- 1/2.3 type back-illuminated CMOS
- 20.3MP effective pixels
- DIGIC 6 processor with iSAPS
- 4.3-215mm zoom lens
- 50x optical zoom
- 100x ZoomPlus
- 9-point AF system
- GPS via mobile
- ISO sensitivity 80 - 1600

Pros: Good image stabilisation. NFC connectivity. Full HD 60p video.
Cons: No Raw capability. Poor battery life. Low res LCD screen.

★★★★☆ 4.0

Canon Zoemini instant cameras

Fun, fast, on-the-go photography and printing

Canon
INSTANT CAMERA PRINTER
2x3 INCH PHOTO
Zoemini C

If you are a self-confessed selfie addict and love to share photos with your friends and loved ones, then you need something that is stylish, portable, and can give you instant results with the minimum of fuss. For every special moment that needs to be captured, you can have a camera and printer small enough to fit in your pocket and with such a compact system, it has never been easier to shoot and print on the go. Canon offers several options that range from 2-in-1 models with cameras and printers built in, to the option to use a portable printer that connects to your mobile devices for on-the-spot image capture and printing, just when you need it.

You might wonder how it is possible to build a printer into a compact camera and make it small enough to fit in the palm of your hand. It's all made possible by Canon's ZINK Zero Ink) photo paper. ZINK paper is infused with a layer of micro crystals that react when heat is applied by the device. If you've ever had a receipt printed in your local store, it's a colour version of that technology. Let's be honest, it isn't archival quality, but it is a great little toy for creating prints instantly.

There are several flavours of Zoemini devices that you can choose from, depending on your needs. The basic Zoemini is just a printer with a 10 sheet capacity that connects to your smart device via the Canon Mini Print app. Next up is the Zoemini C, which lets you both capture and print from the same device, incorporating a 5MP camera and 2x3" ZINK paper prints. If you need more resolution, you can opt for the Zoemini S with an 8MP camera and 314 x 600dpi prints. It's all you need for snaps on the go. ■

TOP PICK
Canon
INSTANT CAMERA PRINTER + APP
2x3 INCH PHOTO
Zoemini S

Zoemini S

£149/$159/€169

(US Ivy Cliq+)

Instant capture of treasured memories.

- 8MP camera
- Flash and 8 LED fill light
- Auto ISO 100-1600
- ZINK printing technology
- Smartphone ready
- 188g model
- Available in Matt Black, Pearl, White, or Rose Gold
- 314 x 600 dpi resolution
- Bluetooth connectivity
- Remote shutter with Canon Mini Print app
- Micro SD card support
- Selfie mirror and ringlight
- 25 print battery life
- 121 x 80.3 x 21.5mm

Pros: A useful companion app. More powerful flash than Zoemini C.
Cons: Slow to start up. Viewfinder may not be so accurate. No LCD screen.

★★★★☆ 4.0

Canon
INSTANT CAMERA PRINTER
2x3 INCH PHOTO
Zoemini C

Zoemini C

£109/$99/€119

(US Ivy Cliq)

A perfect pocket companion.

- 5MP camera
- Flashlight
- Auto ISO 100-1600
- ZINK printing technology
- Smartphone ready
- 170g model
- Available in Pink, Yellow, Green and Blue
- 314 x 500 dpi resolution
- Bluetooth connectivity
- Remote shutter with Canon Mini Print app
- Micro SD card support
- Selfie mirror and ringlight
- 25 print battery life
- 121 x 78.3 x 23.7mm

Pros: No worries about ink running out. 25 print battery life from one charge.
Cons: Flash ring not as powerful as Zoemini S. Prints can be a bit muddy.

★★★☆☆ 3.0

Canon
Zoemini
Canon
Zoemini
#smile
#friends
#werule
#bffs
#squadgoals

Zoemini

£80/$99/€111

(US Ivy)

Print it as soon as you shoot it.

- 10 sheet capacity
- ZINK printing technology
- 2 x 3" prints
- 160g model
- 314 x 400 dpi resolution
- Bluetooth connectivity
- 50 second print speed
- Borderless printing
- Selfie mirror and ringlight
- 20 print battery life
- 118.3 x 82.3 x 18.7mm
- iOS and Android compatible

Pros: Creative and easy to use app. Decent print speed. Lots of fun filters.
Cons: Battery life. No charge remaining indicator. For smartphones only.

★★★★☆ 4.0

EOS for beginners

New creative photographic opportunities await

Canon
CANON ZOOM LENS EF-M 15-45mm 1:3.5-6.3 IS STM
φ49mm

Take more creative control of your photography with a range of digital cameras for enthusiasts that are as easy to use as you need them to be, with image quality that is sure to impress. Turn snaps and video clips into something far more wonderful: images and footage that you are proud of and want the world to see. Use high-end techniques such as shallow depth of field to create differential focus and draw your viewer's eye to your subject. Make your images distinctive with the use of creative filter effects that can all be done in-camera with the touch of a button.

Take command of your camera with controls that are easy and intuitive. Touchscreen LCDs give you greater access to your camera's functions and shooting modes. You can even focus and take photos with just a tap of the screen. All you favourite moments can be captured with responsive cameras that can rapidly autofocus so you never miss a shot.

You even have an on-screen guide to various features of your camera. The guide provides descriptions of many of the camera functions along with helpful advice on how to use them. Now you can shoot in confidence. ■

Canon EOS M6 II

£899/$994/€1099

Lightweight, but powerful, camera for superb images.

- APS-C sensor
- 32.5MP effective pixels
- 180° tilting touchscreen
- DIGIC 8 image processor
- UHD and Full HD
- 14fps continuous shooting
- Bluetooth & Wi-Fi connectivity
- 5,481 selectable AF positions
- ISO range of 100-25600

Pros: High-resolution 32.5MP sensor. 4K video. Manual/Auto focus switch.
Cons: EF-M range of lenses is limited. EVF is an optional add-on.

★★★★☆ 4.0

Canon EOS M6

£839/$899/€939 with 15-45mm kit lens

The speed and performance of a DSLR.

- 24.2MP APS-C CMOS sensor
- Up to 9fps continuous shooting
- 3.0 inch vari-angle touchscreen
- Full HD 1080p video recording
- 5-axis video stabilisation
- ISO range 100-25600
- DIGIC 7 image processor
- Dual Pixel CMOS AF
- Good ergonomic design

Pros: A lot of direct manual control. Compact and lightweight. Good autofocus system.
Cons: Build quality needs improving. No electronic viewfinder. No 4K video.

★★★★★ 5.0

Canon EOS M3

£543/$764/€522 with 15-45mm kit lens

A great handling performer.

- 24.2MP APS-C sensor
- Built-in flash
- ISO range 100-12800
- Wi-Fi and NFC connectivity
- 4.2fps continuous shooting
- 3.5 stop optical image stabilisation
- Hybrid CMOS autofocus
- Powerful DIGIC 6 processing
- 31 AF points

Pros: Good image quality. User friendly touchscreen. Handles well.
Cons: Slow performance. Lens choices limited. Limited dynamic range. No 4K video

★★★★⯪ 4.5

Canon EOS M200

£499/$549/€560

A smart and small, multimedia compact.

- 24.1MP APS-C CMOS sensor
- DIGIC 8 image processor
- 3.0 inch 1.04m dot 180° tilt touchscreen
- UHD and HD movies
- 720p 120fps video recording
- Dual Pixel CMOS AF
- 143 AF points
- ISO range of 100-25600
- Bluetooth & Wi-Fi connectivity

Pros: Simple to operate. Uses the new DIGIC 8 processor. 4K video.
Cons: A modest upgrade on the M100. No viewfinder. A little basic.

★★⯪☆☆ 2.5

Canon EOS M5

£999/$1099/€1259 with 15-45mm kit lens

Compact and connected.

- 24.2MP CMOS sensor
- Full HD 1080p movies at 60fps
- Wi-Fi and NFC connectivity
- In-camera 5-axis digital stabilisation
- 7fps continuous shooting in Raw
- Large electronic viewfinder
- Powerful DIGIC 7 processing
- 49 AF points
- Large, tilt touchscreen

Pros: Excellent electronic viewfinder. Great touchscreen. Good connectivity.
Cons: Expensive. No 4K UHD option. Build quality is lacking.

★★★★☆ 4.0

Canon EOS M50

£490/$629/€545

Versatile mirrorless camera.

- 24.1MP APS-C CMOS sensor
- Powerful DIGIC 8 processing
- EF-M lens mount
- Dual Pixel CMOS AF System
- Maximum 143/99 AF points
- 10fps continuous shooting
- ISO range 100-51200
- Raw shooting
- 4K video shooting

Pros: Excellent image quality. Responsive autofocus. Fully articulating screen.
Cons: Restricted 4K video. Limited choice of EF-M lenses. Clunky control system.

★★★★⯪ 4.5

Canon EOS M10

£298/$449/€338 with 15-45mm kit lens

DSLR quality in a compact body.

- 18.0 MP APS-C size CMOS sensor
- Hybrid CMOS AF II for fast and smooth focus
- Large, tilt touchscreen for clear viewing
- Powerful DIGIC 6 processing
- Dynamic Image Stabilisation
- 49 AF points
- Built-in flash
- 4.6 fps for approx. 1000 JPEG images
- Creative Assist

Pros: Excellent value for money. Easy to use for beginners. Very good image quality.
Cons: Limited creative features. Body finish quite slippery. EF-M lens range limited as yet.

★★★★½ 4.5

Canon EOS M100

£699/$599/€759 with 15-45mm kit lens

Compact and easy to use.

- 24.2 MP APS-C sensor
- Built-in flash
- Built-in Wi-Fi, NFC and Bluetooth
- Dual Pixel CMOS AF
- 3.0-inch tilt-type LCD
- Full HD 60p movie recording
- Powerful DIGIC 7 processing
- Up to 6.1 fps with AF Lock
- ISO of up to 25600

Pros: Very small and compact. Useful 180 degree vari-angle screen.
Cons: No 4K video will put certain users off. Limited capabilities.

★★★★☆ 4.0

Canon EOS 1200D (US Rebel T5, Japan Kiss X70)

£235/$339 (body only)

Embrace every opportunity

- 18 megapixel CMOS
- Great low light shots
- EOS Companion free app
- Choice of AF points for creative framing
- Continuous shooting at 3fps
- Powerful DIGIC processing
- Large bright screen for clear viewing
- Stunning 1080p movies
- Easily create engaging movies

Pros: Very affordable entry level. Good low-light performance. Easy to use for novices.
Cons: Live view AF is slow. Shooting speed is slow. Monitor could be sharper.

★★★★½ 4.5

Canon EOS 100D (US Rebel SL1, Japan Kiss X7)

£279/$399 (body only)

A DSLR you'll never want to leave behind

- 18 megapixel CMOS
- Great low light shots
- High speed shooting
- Continuous AF in Movies
- Large bright touchscreen
- Powerful DIGIC processing
- Stunning 1080p movies
- Scene Intelligent Auto
- On camera feature guide

Pros: Excellent handling. Light and compact. Good creative features.
Cons: AF system a bit primitive. Battery life less than rivals. Older model soon to be replaced.

★★★★½ 4.5

Canon EOS 200D (US Rebel SL2, Japan Kiss X8)

£579/$549/€594 (body only)

Affordable quality.

TOP PICK

- 24.2 MP APS-C sensor
- 9 AF points
- Full HD movies at 60fps
- 5fps continuous shooting
- ISO range from 100-25600
- Powerful DIGIC 7 processing
- 1040k vari-angle touchscreen
- NFC and Bluetooth connectivity
- 63-zone dual-layer metering

Pros: Excellent touchscreen. Great image quality. User friendly.
Cons: Only 9 AF points. No 4K video. Relatively expensive.

★★★★★ 5.0

Canon EOS 750D (US rebel T6i - Japan X8i)

£569/$699/€638 (body only)

Assured automatic shooting.

- 24.2MP APS-C CMOS sensor
- 19-point autofocus system
- Hybrid CMOS AF III focus system (live view)
- 7560 pixel RGB + IR metering sensor with skin tone detection
- 3" fully articulating touchscreen LCD
- Wi-Fi with NFC
- 5 fps continuous shooting
- 1080/30p video

Pros: Fast autofocus system. Wi-Fi and NFC connectivity. Accessible controls.
Cons: Image quality could be better. Viewfinder coverage limited. Video mode is mediocre.

★★★★☆ 4.0

Canon EOS 760D (US Rebel T6s - Japan 8000D)

£619/$699/€ 754 (body only)

More creative freedom.

Canon
EOS 760D

- 24.2MP APS-C CMOS sensor
- Servo AF in live view
- Eye sensor for use with optical viewfinder
- LCD information display on top plate
- Quick control dial on rear
- 5 fps continuous shooting
- 1080/30p video
- Hybrid CMOS AF III focus system (live view)
- 3" fully articulating touchscreen LCD

Pros: Very good value for money. Latest autofocus technology. Folding touchscreen monitor.
Cons: Plastic body, aluminium frame. No weatherproofing. Video mode is mediocre.

★★★★⯪ 4.5

Canon EOS 2000D (US Rebel T7, Japan Kiss X90)

£325/$549/€399 (body only)

An easy and intuitive first DSLR.

Canon
EOS 2000D

- 24.2MP APS-C sensor
- Optical viewfinder With 9 point AF
- Image stabilisation
- 7.5cm 920,000 dot LCD monitor
- Built-in flash
- 3fps continuous shooting
- DIGIC 4+ image processor
- Full HD video capture
- ISO range 100-6400

Pros: High resolution sensor. User friendly. Built-in Wi-Fi
Cons: No vari-angle screen. No 4K video capture. Only 3fps continuous shooting.

★★★★☆ 4.0

Canon EOS 4000D (US Rebel T100)

£249/$329 (body only)

Affordable DSLR photography.

Canon
EOS 4000D

- 18MP APS-C sensor
- Optical viewfinder With 9 point AF
- 6.8cm 230,000 dot LCD monitor
- Built-in flash
- 3fps continuous shooting
- DIGIC 4+ image processor
- Full HD video capture
- Creative filters
- ISO range 100-12800

Pros: High resolution sensor. User friendly. Built-in Wi-Fi
Cons: No vari-angle screen. No 4K video capture. Only 3fps continuous shooting.

★★★★☆ 4.0

Canon EOS 250D (US Rebel SL3, Japan Kiss X10)

£529/$549/€556

The world's lightest DSLR.

Canon
EOS 250D

- 24.1MP APS-C sensor
- 4K movies at 25fps
- 5fps continuous shooting
- +/-5 EV exposure compensation
- ISO range from 100-51200
- DIGIC 8 processing
- 1040k vari-angle touchscreen
- Wi-Fi and Bluetooth connectivity
- 63-zone dual layer metering

Pros: Extremely lightweight construction. Great price. 4K video.
Cons: Viewfinder coverage poor. Only 9 AF points. Cropped video.

★★★★⯪ 4.5

Canon EOS 1300D (US Rebel T6, Japan Kiss X80)

£289/$318/€299 (body only)

High quality images.

Canon
EOS 1300D

- 18 MP APS-C sensor
- Full HD movies
- DIGIC 4+ image processor
- 9 AF points
- ISO 100-6400
- 3fps continuous shooting
- Bright 3.0 inch LCD
- Built-in NFC and Wi-Fi
- 95% viewfinder coverage

Pros: Great value. Built-in Bluetooth and Wi-Fi. Good beginner's camera.
Cons: No touch sensitive screen. Continuous shooting rate is low.

★★★⯪☆ 3.5

Canon EOS 800D (US Rebel T7i, Japan Kiss X9i)

£769/$749/€759 (body only)

A next generation DSLR.

Canon
EOS 800D
TOP PICK

- 24.2 MP APS-C CMOS sensor
- 3.0 inch vari-angle touchscreen
- Dual Pixel CMOS AF
- Full HD video recording at 60fps
- ISO range 100-25600
- ISO expandable to 51200
- Built-in Wi-Fi Bluetooth and NFC
- Powerful DIGIC 7 processing
- 6fps continuous shooting

Pros: Excellent image quality. Rapid AF performance. Easy to use.
Cons: Build quality feels cheap. More cost effective options available.

★★★★★ 5.0

EOS for enthusiasts

Develop new skills with a state-of-the-art DSLR

Now you can enjoy ultimate image quality from APS-C and full-frame high-performance sensors. Delve deeper into the fascinating world of photography, try out new ideas and tackle new projects. You have world leading imaging technology at your fingertips, so it's time to raise your game and shoot like you never thought possible before. The EOS system really helps you as you explore new compositions, locations and effects. Whether APS-C or moving up to full-frame, you can enjoy amazing levels of performance and image quality. You can shoot with ambient low light thanks to high ISO capability; or track and capture the action with faster and more accurate autofocus precision.

Thanks to HD video capture built in to your EOS camera, you can be just as creative with your movies as you are with your photos. If you can imagine it, you can capture it too. Your photos and movies will go to the next level and you will find yourself enjoying the process like never before. The camera's built in technology is there to assist whenever you need it. It even boasts transparent LCD overlays on the viewfinder to impart important information that gives you the guidance you need to improve your skills. A Canon DSLR is waiting for you, but which one? ■

Canon
EOS
90D
CANON ZOOM LENS EF-S 18-135mm 1:3.5-5.6 IS USM
φ67mm

Canon EOS 60Da

£699/$1466/€953 (body only)

For astrophotographers.

- More sensitivity to IR light.
- 18-megapixel APS-C CMOS sensor
- Vari-angle 7.7cm (3.0") 3:2 Clear View LCD screen
- ISO 100-6400, expandable to ISO 12,800
- Time-lapse shooting with EOS Utility software or optional TC-80N3

Pros: Dedicated astronomy camera. Good utility software. Excellent IR sensitivity.
Cons: Older autofocus system. Quite expensive. Only really useful for astrophotography.

★★★☆☆ 3.0

Canon EOS 80D

£948/$1199/€1065 (body only)

Fast, powerful and versatile.

- 24.2 MP APS-C CMOS sensor
- 7fps continuous shooting
- DIGIC 6 image processor
- ISO 100-16000 expandable to 25600
- Built-in intervalometer
- Full HD 1080p movies at 60fps
- NFC and Wi-Fi connectivity
- 3.0 inch vari-angle touchscreen
- 45 AF points

Pros: Good image quality. Rapid and accurate AF system. Great touchscreen.
Cons: Some might find the AF system hard to master. No 4K video.

★★★★★ 5.0

Canon EOS 7D Mark II

£1599/$1699/€2181 (body only)

An exciting DSLR to capture all the action.

- 20.2 MP APS-C CMOS sensor
- 10fps continuous shooting
- 65-point AF system with iTR AF
- Dual Pixel CMOS
- Powerful dual DIGIC 6 processing
- Dual memory cards slots
- RGB and IR metering sensor for accurate exposure metering
- Geotag each photo and movie

Pros: Comfortable handling. Excellent image quality. Latest autofocus technology.
Cons: No 4K video mode. No Wi-Fi connectivity. Very expensive compared to rivals.

★★★★½ 4.5

Canon EOS 90D

£1200/$1349/€1299

Fast performance from a full-featured DSLR.

- 32.5MP APS-C CMOS sensor
- DIGIC 8 image processor
- 3.0 inch 1.04m dot vari-angle screen
- 4K UHD 30P video and HD 120P video
- 45-point all cross-type AF system
- Electronic shutter up to 1/16000th
- Bluetooth & Wi-Fi connectivity
- 5,481 selectable AF positions
- 10fps continuous shooting rate

Pros: Uncropped 4K video. 32.5MP sensor. Good ergonomics. Good battery life.
Cons: Elevated noise apparent at higher ISO levels. Not fully weatherproof.

★★★★½ 4.5

Canon EOS 77D

£829/$849/€854 (body only)

Powerful performance and control.

- 24.2 MP APS-C CMOS sensor
- Fastest Live View AF system
- Dual Pixel CMOS AF
- EOS integrated cleaning system
- 45 cross-type AF points
- ISO range from 100-25600
- 3.0 inch 1040K dot LCD
- 6fps continuous shooting
- Full HD 1080p movies at 60fps

Pros: Good 45 point AF system. Excellent Live view performance. Great image quality.
Cons: No 4K video mode. Only 95% viewfinder coverage. Low burst shooting rate.

★★★★½ 4.5

Canon EOS 6D Mark II

£1680/$1999/€1849 (body only)

The entry into the world of full-frame shooting.

- 26.2 MP full-frame CMOS sensor
- Max ISO 40000 expandable to 102400
- In-camera 5-axis digital stabilisation
- Full HD movies at 60fps
- Max burst rate of 6.5fps
- 3.0 inch vari-angle LCD touchscreen
- 4K time-lapse mode
- 45 AF points
- 4.2fps continuous shooting

Pros: Comfortable handling. Useful connectivity options. Refined touchscreen.
Cons: No 4K video mode. No USB 3.0. Viewfinder coverage slightly limited.

★★★★½ 4.5

EOS advanced

Used the world over from war zones to fashion shoots

When it comes to reliability, performance and the production of creative photography and video, the Canon professional range of camera bodies is the one-stop shop for results that you and your clients will love. Whatever the conditions, Canon's professional DSLR reliable performance will keep you shooting and keep delivering the shots you need. They are weather resistant, keeping dust and moisture at bay and their magnesium-alloy construction provide reliable strength and welcome lightness.

Look at any high-end sporting event or fashion shoot and you will see Canon professional cameras and lenses. Sports shooters love them for their advanced autofocus ability to lock on and track the action, coupled with amazing optics from the range of lenses available; it makes them a formidable image capture system. The full-frame benefits of these cameras is also beloved by portrait photographers who enjoy amazing image quality and prime lenses that offer large maximum apertures to deliver amazing shallow depth of field for creative selective focus effects.

If you demand the highest standards of performance and reliability, these cameras will deliver. It's no wonder they are used the world over and now their video capabilities can even be seen on mainstream TV shows. With the Canon range of advanced DSLRs, revolutionise the way you capture stills and video. ■

Canon EOS 5D Mark III

£1959/$2499/€2672 (body only)

A full-frame DSLR

- 22.3 megapixel full-frame sensor
- 61-point AF
- 6 fps continuous shooting
- ISO 100–25,600 sensitivity
- Full-HD video with manual control
- 14-bit DIGIC 5+ processor
- Weather sealing
- 8.11cm (3.2-inch) 1,040,000-dot screen
- HDR mode

Pros: Great image and video quality. Amazing build quality. Fast all-round performance.

Cons: Expensive to buy. Low resolution compared to rivals. An older model now.

★★★★★ 5.0

Canon EOS 5D Mark IV

£3349/$3299/€3249 (body only)

Explore the world of full-frame shooting.

- 30.4 MP full-frame CMOS sensor
- Dual Pixel Raw image system
- DIGIC 6+ image processing
- 4K UHD video capability at 30fps
- 150,000-pixel metering sensor
- 61 AF points
- 7fps continuous shooting
- ISO range 100-102400
- 3.2 inch 1620000 pixel screen

Pros: Advanced AF. 7fps continuous shooting. Excellent image quality.

Cons: 4K video options limited. ISO range unchanged. Expensive compared to rivals.

★★★★½ 4.5

Canon 5DS

£2998/$3699/€4089 (body only)

Capture extraordinary detail.

- 50.6 MP full-frame CMOS sensor
- Dual DIGIC 6 processors
- EOS Intelligent Tracking and Recognition AF
- 61-point wide-area AF
- Weather sealing
- HDR and multi exposure Imaging
- Full HD movies
- Built-in interval timer
- ISO 50-12800 sensitivity

Pros: Astonishing detail resolution. Tough weatherproof body. Excellent autofocus system.
Cons: Expensive, with comparatively slow performance. Limited ISO range.

★★★★☆ 4.0

Canon EOS-1D C

£5760/$8829/€7857 (body only)

Superb 4K movies and stunning stills.

- 4K movies
- 1080p at 50/60fps
- 18.1 MP full-frame CMOS
- Up to 12fps and 14fps stills
- 61 point AF system
- ISO range 100-25600
- Dual DIGIC 5+ processors
- Clear View II 8.1cm (3.2”) LCD
- EF and EF Cine lens compatible

Pros: Professional 4K video mode. Superb still and video image quality. Tough and weatherproof.
Cons: Staggeringly expensive. Designed for professional video. Heavy and bulky.

★★★★½ 4.5

Canon EOS-1D X

£4999/$5299/€6819 (body only)

Performance redefined.

- 18.1 MP full frame CMOS sensor
- 14fps High speed mode
- 100-51200 ISO, up to H:204800
- 61 point AF system
- 100,000 pixel RGB AE metering
- Full HD 1080p EOS movie
- Dual “DIGIC 5+” processors
- Clear View II 8.11 cm 1,040k LCD
- Ethernet port

Pros: Exceptional low-light performance. Amazing burst shooting speed. Unbeatable build quality.
Cons: Very expensive. Heavy and bulky to carry around. Complicated control layout.

★★★½☆ 3.5

Canon 5DS R

£3198/$3899/€4362 (body only)

Amazing sharpness and resolution.

- Low-pass filter cancellation for even sharper images
- 50.6 MP full-frame CMOS sensor
- Dual DIGIC 6 processors
- EOS Intelligent Tracking and Recognition AF
- 61-point wide-area AF
- Weather sealing
- HDR and multi exposure Imaging
- Full HD movies

Pros: Astonishing detail resolution. Tough weatherproof body. Excellent autofocus system.
Cons: 5DSR particularly expensive. Relatively slow performance. Limited ISO range.

★★★★½ 4.5

Canon EOS C100

£2500/$2000/€2800

Affordable, quality video production.

- Dual Pixel CMOS AF
- Super 35 24.6mm x 13.8mm sensor
- 4206 x 2340 actual sensor resolution
- 3820 x 2160 effective sensor resolution
- ISO 320 to 80,000
- Canon EF lens mount
- Built-in ND filter
- 2 x SDXC card slots
- 1,560,000 dots electronic viewfinder

Pros: Very ergonomic. Great audio control. Improved dynamic range.
Cons: Has the potential to be even better with some serious firmware updates.

★★★★½ 4.5

Canon EOS 1D X Mark II

£4799/$5999/€5232 (body only)

The ultimate in shooting performance.

- 20.2 MP CMOS sensor
- Dual Pixel CMOS AF technology
- 61-point AF system
- AI Servo AF III+ for AF precision and tracking
- Dual DIGIC 6+ processors
- 16fps continuous shooting
- 4K video recording at 60fps
- ISO 100-51200 expandable to 50-409600
- 3.2 inch 1,620K pixel LCD touchscreen

Pros: Amazing advanced AF. 4K record at 60fps. Great control layout for excellent handling.
Cons: Expensive. Touchscreen clunky. Only small resolution increase since the 1D X.

★★★★½ 4.5

The EOS R full-frame mirrorless system

A new system that can integrate and complement your existing EOS equipment

Although mirrorless cameras have been with us for a number of years, Canon has taken its innovative and popular EOS system and developed it still further with the brand new EOS R and RP cameras. They've taken all the things you love about the EOS DSLR and built a full-frame mirrorless system around it. You have greater and more varied creative possibilities and even more ways of capturing that decisive moment that will take your photography and your filmmaking to new heights.

The new EOS R lens mount system comes with five new lenses built specifically for this new system that will give you unrivalled clarity and image quality across a range of prime and zoom lens types. Don't worry if you have already invested in other EF and EF-S lenses, Canon has made the new EOS R and RP cameras compatible with their vast range of existing lenses. A lens mount adapter is available that can let you use all your existing favourite lenses with the new EOS R and RP camera bodies. Plus, the current range of Speedlite flashes and accessories are all compatible too.

EOS R incorporates a 30.3MP sensor, fast, accurate focusing and the ability to get perfect focus lock in low light situations. Couple that with a high ISO capability and you have a camera that can shoot in the most demanding situations; and its 8fps continuous shooting speeds mean that you never miss a moment. The latest EOS RP is a smaller and lightweight camera with a 26.2MP sensor that has been designed for both travel and everyday photography.

The EOS R system is the DSLR improved; with a smaller, lighter build alongside the same handling and ergonomics you've come to expect from the popular EOS system. Whether you are a professional photographer, filmmaker, or just an enthusiast, you have a choice of cameras that can comprehensively cover every need. ■

Canon
EOS
R
CANON LENS RF50mm F1.2 L USM
AF MF

Canon EOS R

£2350/$2230/€2585

Canon's first full-frame mirrorless.

- 30.3MP sensor
- Dual Pixel CMOS AF sensor
- Powerful DIGIC 8 image processor
- RF lens mount
- EF and EF-S lenses via mount adapter
- 8fps continuous shooting
- Wi-Fi and Bluetooth connectivity
- 0.5 inch 3.69M dot OLED EVF
- 8cm 2.1M dot LCD monitor
- 4K video 30fps
- ISO range 50-102400
- -6 EV low light autofocus
- 132.5 x 98.3 x 84.4mm

Pros: Smaller and lighter than standard full-frame DSLRs.

Cons: Brand new system has limited lenses at the moment.

★★★★½ 4.5

MODE
LOCK
M-Fn
TV
F4.0
8000
40000

Canon
28-70
LOCK

Canon
35
EOS RP
ON OFF
M-Fn
LOCK

Canon EOS RP

£1399/$1299/€1429

A compact full-frame mirrorless.

- 26.2MP sensor
- Dual Pixel CMOS AF sensor
- Powerful DIGIC 8 image processor
- RF lens mount
- EF and EF-S lenses via mount adapter
- 4779 selectable AF points
- Wi-Fi and Bluetooth connectivity
- 0.5 inch 3.69M dot OLED EVF
- 7.5cm 1.04M dot vari-angle LCD
- 4K video 25fps
- ISO range 50-102400
- 132.5 x 85 x 70mm

TOP PICK

Pros: Priced well to compete. Lightweight construction. 4K video.

Cons: Battery life below par. Dwarfed by the bigger RF lenses.

★★★★½ 4.5

Canon lenses

Team a great camera with a great lens for perfect images

Canon lenses are renowned for their optical abilities and the vast range available. Whether you are teaming an EOS M camera with a portable and lightweight EF-M lens or attaching a super-telephoto lens to one of their latest professional DSLRs, you can be sure there is something to suit everyone's needs.

Lenses have many different functions and abilities that allow you as a photographer to frame, compose and capture exactly what you need for the job in hand. If you want a cheap prime lens, with very shallow depth of field due to its large maximum aperture for some portrait work, then you have some great choices. If you need a more exotic tilt-shift lens for architectural photography, then there is a lens for you too. If sport and wildlife photography is more your game, then there are a number of fixed focal length and zoom lenses that can bring distant action right up close. The range is huge but over the following pages, we bring you our pick of various lenses for you to consider. ■

70 100 135 200 300
LOCK
70-300mm
IMAGE STABILIZER
NANO USM
Canon
Canon
EOS
90D
CANON ZOOM LENS EF-S 18-135mm
STABILIZER
ON OFF
LOCK

EF-M lenses

Compact lightweight lenses designed exclusively for the EOS M-mount cameras

Canon
Canon
CANON ZOOM LENS EF-M 18-150mm 1:3.5-6.3 IS STM
EOS
φ55mm

EF-M 11-22mm f/4-5.6 IS STM

£319/$599/€435

Capture panoramic landscapes with this ultra-wide angle 11-22mm EF-M zoom lens.

Canon
11-22mm

- Ultra-wide 11-22mm EF-M zoom lens
- Compact, retractable lens design
- Smooth, quiet STM focusing in movies
- Dynamic IS for steady movies
- 3-stop optical Image Stabiliser
- High image quality
- 0.15m minimum focusing distance
- Manual focus ring

Pros: Very useful 3 stops of image stabilisation. Small and light. Low distortion.
Cons: Not very fast aperture, even wide open. A little pricey for what it is.

★★★★☆ 4.0

EF-M 15-45mm f3.5-6.3 IS STM

£229/$299/€317

A light, compact and versatile standard zoom lens ideal for everyday photography.

15-45mm
Canon

- Versatile zoom covering wide-angle to short telephoto perspectives
- Offers a 24-72mm equivalent focal length
- Optical design incorporates three aspherical elements controls distortion
- Optical Image Stabiliser incorporated into the lens design
- Capture sharp images even in low light

Pros: Good quality glass, and sharp across all apertures. Lightweight construction.
Cons: The lock button to deploy the zoom can be fiddly. Max aperture not the best.

★★★★☆ 4.0

EF-M 22mm f/2 STM

£154/$92/€209

A compact wide-angle pancake lens ideal for landscapes and everyday snapshots.

- 22mm wide-angle lens
- Easy to carry alongside your EOS M
- Superb low light results with f/2.0 aperture
- Smooth, quiet STM focusing in movies
- Great image quality from aspherical lens elements
- Shoot smooth out of focus backgrounds

Pros: Small, lightweight, and robust. Max aperture great for low light. Crisp images.
Cons: No auto/manual focus switch. Chromatic aberration reported. It hunts in video mode.

★★★★½ 4.5

EF-M 28mm f/3.5 Macro IS STM

£280/$299/€309

A unique macro lens to magnify and illuminate your world of photography.

- World's first lens with a built-in Macro Lite
- Capable of focusing at infinity
- Hybrid IS for steady handheld photography
- One UD lens and two aspherical lenses
- Outstanding image clarity
- Equivalent to 45mm standard lens

Pros: Comes with a built-in macro light for close-up work. Good stabilisation and lightweight.
Cons: Focusing is not as fast and precise as you would like. Wider aperture would have been nice.

★★★★½ 4.5

EF-M 32mm f/1.4 STM

£499/$479/€560

For portraits, candids and compositions with a pleasing natural perspective.

- 51mm equivalent focal length
- f/1.4 maximum aperture
- f/16 minimum aperture
- Super Spectra Lens Coating
- 14 elements in 8 groups
- 7 diaphragm blades
- 46° diagonal angle of view
- Closest focusing distance 0.23m.

Pros: A good quality lens. A very fast and sharp EF-M mount lens, even at f/1.4.
Cons: Quite an expensive lens. Focusing not as fast as its USM cameras. No image stabilisation.

★★★★★ 5.0

EF-M 18-55mm f/3.5-5.6 IS STM

£219/$179/€298

The standard kit lens of the EOS M system. A versatile performer, great for stills and video.

- Versatile 18-55mm zoom lens ideal for everyday use
- Easy to carry alongside your EOS M
- Smooth, quiet STM focusing in movies
- Dynamic IS for smooth movies
- Sharp images with 4-stop Image Stabiliser
- Fast Auto Focus in stills, full time manual override

Pros: Great sharpness for a kit lens. Well constructed. Good everyday zoom lens.
Cons: Not particularly fast glass with f/3.5 variable aperture. Slow performer.

★★★★☆ 4.0

EF-M 18-150mm f/3.5-6.3 IS STM

£399/$499/€433

For landscapes or detail, this lens is ideal for your EOS M camera.

- Versatile 18-150mm EF-M zoom lens
- 1x UD and 2x precision aspherical elements
- Focus down to 0.25m
- Dynamic IS for steady movies
- 4-stop optical Image Stabiliser
- High image quality
- Weighs just 300g
- Optional 55mm filters

Pros: Lightweight and compact design. Sharp images. Useful close-up mode. 4 stops of IS.
Cons: A little costly compared to others. Zoom action could do with more dampening.

★★★★★ 5.0

EF-M 55-200mm f/4.5-6.3 IS STM

£262/$339/€357

A compact telephoto zoom with image stabilisation that gets you closer to the action.

- Get closer to the action
- Image Stabiliser keeps images sharp
- Compact enough to go anywhere
- Smooth, near-silent STM focusing
- Make quick adjustments with a manual focus ring
- Shoot great quality images with sharp details and rich colour

Pros: A great performer for its size. Useful zoom range. Sharp and effective colour rendition.
Cons: It's not a fast lens with a lack of good bokeh. Plastic build. A bit expensive.

★★★★½ 4.5

EF-S lenses

Get creative with focal lengths from ultra-wide to telephoto with lenses for APS-C sized sensors

EOS 100D
CANON ZOOM LENS EF-S 18-55mm 1:3.5-5.6 IS STM
φ58mm

EF-S 10-18mm f/4.5-5.6 IS STM

£180/$249/€245

A light and compact wide-angle zoom.

- Get more in every shot with this ultra-wide zoom lens
- Easy to carry thanks to a compact design
- Smooth, near-silent AF when shooting movies
- 4-stop Image Stabiliser
- 0.22m close focusing

Pros: Smooth and quiet motor. Amazing 4 stops of image stabilisation. Exceptional image quality.
Cons: It uses a plastic mount, not metal. Can be a bit soft at the widest apertures.

★★★★★ 5.0

EF-S 10-22mm f/3.5-4.5 USM

£499/$649/€534

A small lightweight and ultra-wide-angle lens.

- Super wide angle zoom
- Superb image quality
- Lightweight and compact
- Focusing distance of just 24cm.
- Fast near-silent USM AF
- Super Spectra coatings
- Circular aperture

Pros: Excellent image quality and colour rendition. Lightweight and compact.
Cons: Filters will be visible at the wide end. Faster aperture would have been nice.

★★★★★ 5.0

EF-S 15-85mm f/3.5-5.6 IS USM

£529/$799/€721

A versatile image stabilised zoom lens.

- High performance all-purpose zoom
- 4 stop Image Stabiliser
- Automatic panning and tripod detection
- 0.35m close focusing
- UD and aspherical lenses
- 7-blade aperture
- Optional lens hood

Pros: The focus is fast and accurate. Images are sharp with good contrast. AF is quiet.
Cons: Some softness noted at edges. A little pricey. Disappointing bokeh. Quite heavy.

★★★★½ 4.5

EF-S 18-55mm f/3.5-5.6 IS II

£149/$199/€129

Affordable general purpose lens.

- Lightweight, compact design
- Wide-angle to short telephoto range
- Four stop Image Stabiliser
- Aspherical lens elements
- 0.25m close-focusing distance
- Circular aperture diaphragm
- High-speed AF

Pros: Excellent image quality, particularly around f/8. Low distortion. 4 stop stabilisation.
Cons: Can cause fringing in high contrast situations. Manual focus control a bit fiddly.

★★★★½ 4.5

EF-S 55-250mm f/4-5.6 IS STM

£157/$199/€213

A powerful zoom, with image stabilisation.

- Get close to distant subjects
- Smooth, quiet STM focusing
- Image Stabiliser reduces blur
- Lightweight, compact design you can take everywhere
- Easy-to-use design that delivers superb image quality

Pros: Great lens at a decent price. Spot on focusing is fast and quiet. Lightweight.
Cons: Focusing on distant objects may be difficult. Max aperture may not be suit all.

★★★★½ 4.5

EF-S 18-135mm f/3.5-5.6 IS STM

£295/$499/€401

Ultra-wide-angle lens with superb image quality.

- Versatile 18-135mm zoom range
- Smooth, quiet STM focusing
- Dynamic Image Stabiliser for smooth movie footage
- Fast autofocus with full-time manual override
- Minimum focusing distance of 0.39m

Pros: The focus is fast and accurate. Images are sharp with good contrast. AF is quiet.
Cons: Some softness noted at edges. A little pricey. Disappointing bokeh. Quite heavy.

★★★★½ 4.5

EF-S 17-55mm f/2.8 IS USM

£699/$829/€769

A low light lens with constant f/2.8 aperture.

- Wide angle zoom for EF-S mount bodies
- f/2.8 aperture throughout zoom range
- 3-stop Image Stabiliser
- Fast, quiet auto focus
- Super Spectra coating
- Circular aperture for pleasing background blur
- Passes distance information to E-TTL II
- Optional lens hood
- Focus right down to 35 cm

Pros: Focussing is fast, accurate and very quiet. Constant f/2.8 aperture. Very sharp.
Cons: Quality control issues raised. Can suffer lens creep when shooting downwards.

★★★★⯪ 4.5

EF-S 17-85mm f/4-5.6 IS USM

£219/$175/€229

An excellent all-purpose lens.

- Exceptional zoom range for all EF-S mount bodies
- Superb image quality
- Lightweight and compact
- Image Stabiliser with 3 stops compensation
- Fast near-silent USM AF
- Super Spectra coatings
- Circular aperture
- Optional exclusive lens hood

Pros: A fine walkaround lens. Light and relatively compact. Useful zoom range.
Cons: Some reported mechanical problems. Low light focus problematic. Variable aperture.

★★★⯪☆ 3.5

EF-S 35mm f/2.8 Macro IS STM

£369/$299/€379

A macro lens that brings its own light.

- 35mm APS-C lens
- 56mm equivalent focal length
- f/2.8 maximum aperture
- f/32 minimum aperture
- Hybrid image stabiliser
- 10 elements in 6 groups
- 7 diaphragm blades
- 42° diagonal angle of view
- Closest focusing distance 0.13m
- Easy-to-use lighting built-in

Pros: Built-in macro light for extreme close up work. Very low geometric distortion.
Cons: A number of reports speak of autofocus issues and a lack of sharp focus.

★★★⯪☆ 3.5

EF-S 18-200mm f/3.5-5.6 IS

£389/$699/€530

A compact but powerful telephoto zoom.

- 11x zoom lens – 18-200mm
- 4 stop Image Stabiliser
- Automatic panning and tripod detection
- Close focusing distance of 0.45m
- Aspherical and UD lens elements
- Super-Spectra lens coatings combat ghosting and flare
- Zoom lock maintains minimum size
- Circular aperture for pleasing background blur

Pros: One lens fits all uses versatility. 11x zoom. 4 stops of image stabilisation.
Cons: Possible yellow colour cast issues reported. Quality and colour can suffer.

★★★★☆ 4.0

EF-S 24mm f/2.8 STM

£139/$149/€159

A great lens for low light shooting and travel.

- Super-slim, pancake design
- Natural, human eye perspective
- Smooth, quiet focusing when shooting movies
- Close focus to 0.16m
- Uses a large/2.8 aperture to shoot in low light
- Lens construction 6 elements in 5 groups
- Optical zoom 0.27x

Pros: Vivid colours, great contrast and sharpness. Handles chromatic aberration well.
Cons: Noticeable barrel distortion. Vignetting can be rather strong at f2.8.

★★★★☆ 4.0

EF-S 60mm f/2.8 Macro USM

£350/$399/€418

The first true macro lens in the EF-S range.

- 96mm focal length in 35mm format
- Compact and lightweight
- High corner-to-corner resolution, contrast and image quality
- Fast auto focus with nearly silent USM
- Full time manual focus override
- Super Spectra coating
- Macro facility lets you focus right down to 20cm
- Filter Size: 52 mm

Pros: Picture quality is excellent. Apertures from f/2.8 to f/32. Virtually no chromatic aberration.
Cons: Focus breathing can be an issue when changing focus. Blue cast reported.

★★★★★ 5.0

EF prime lenses

Some key selections from the wide choice of
Canon EF full-frame lenses

Canon
EOS
5D
Mark IV

EF 14mm f/2.8L II USM

£1889/$2099/€2571

A precision ultra-wide-angle lens.

- L-series construction with dust and moisture sealing
- Aspherical and UD lens elements
- Circular aperture
- Super Spectra coatings
- Rectilinear design
- Filter Size: Gelatine type

Pros: Very low distortion for such a wide lens. Image sharpness second to none.
Cons: The 16-35mm wide-angle zoom could be a cheaper option. It's a very expensive lens.

★★★★★ 5.0

EF 24mm f/1.4L II USM

£1224/$1549/€1666

A fast aperture wide-angle lens for low light.

- Wide 84° angle of view
- Fast f/1.4 aperture
- Aspherical and UD lens elements
- Subwavelength structure coating
- USM motor with full-time manual focus
- Weather and dust seals
- Robust build quality

Pros: Very good low light capability. Very sharp at f/4 and above. Fast focus. Sharp.
Cons: Autofocus can be way off on certain lenses. Pronounced distortion apparent.

★★★★⯨ 4.5

EF 28mm f/2.8 IS USM

£381/$499/€518

A compact and affordable wide-angle lens.

- 45mm equivalent on APS-C sized sensors
- Fast f/2.8 maximum aperture
- Up to four-stop Image Stabiliser
- Ultrasonic autofocus mechanism
- Circular aperture for soft background blur
- Super Spectra coatings reduce flare

Pros: Wide maximum aperture great for low light. Four stops image stabilisation. Very sharp.
Cons: Built to a price with lighter materials. Some distortion may be noticeable at the edges.

★★★★☆ 4.0

EF 35mm f/2 IS USM

£399/$549/€543

A versatile standard f/2 prime lens.

- Up to four stops of image stabilisation
- Fast f/2 maximum aperture
- Ultrasonic AF for quick focusing
- Compact, lightweight design
- Eight-bladed aperture for smooth bokeh
- Moulded glass elements for sharpness
- 0.24m minimum focus distance

Pros: Very good quality and sharpness for a non-L series lens. IS works very effectively.
Cons: Some diffraction may be noticeable at f/5.6. Expensive and heavy. AF can be loud.

★★★★☆ 4.0

EF 35mm F1.4 II USM

£1550/$1799/€2150

An ultra-fast standard prime lens.

- A wide f/1.4 maximum aperture
- A wide-angle view with a natural perspective
- Superb low-light performance and depth of field control
- Fast and virtually silent USM autofocus
- Keep shooting even in tough conditions with L-series build-quality

Pros: Fast autofocus. Very sharp images. Very wide maximum aperture for low light work.
Cons: Certain lenses reported with loose focus rings. Large and heavy. Very expensive.

★★★★⯨ 4.5

EF 40mm f/2.8 STM

£350/$399/€418

This versatile lens is a great travel companion.

- Portable pancake design
- Smooth, quiet STM focusing
- Fast f/2.8 maximum aperture for low-light shooting
- Close focus to 0.3m
- Fast, quiet AF for pin-sharp results
- Great image quality right across the frame

Pros: Very small and lightweight. Tack sharp images. Low chromatic aberration.
Cons: Reports of difficulty mounting the lens or focusing stopping. Focusing can be slow.

★★★★⯨ 4.5

EF 50mm f/1.2L USM

£1000/$1499/€1361

A fast standard prime lens, offering great performance for everyday photography.

- Large f/1.2 aperture
- USM autofocus
- Super Spectra coatings
- Circular aperture for excellent background bokeh
- Provides distance information for the E-TTL II flash system
- Soft case and lens hood
- Filter size: 72 mm

Pros: Razor sharp images at f1.2 and up. Top-notch L series build quality and optics.
Cons: It can sometimes focus erratically and suffer from chromatic aberration.

★★★★⯪ 4.5

EF 85mm f/1.2L II USM

£1452/$1999/€1976

A professional ultra-fast short telephoto, perfect for low light and creative portraits.

- Extreme f/1.2 maximum aperture
- Fast, quiet autofocus
- Super Spectra coatings
- Circular aperture for smooth background bokeh
- Integration with E-TTL II flash system
- Soft case and lens hood
- Closest focusing distance 0.95m
- Filter diameter 72mm

Pros: Beautiful bokeh wide open. Very sharp, with amazing contrast. Perfect portrait lens.
Cons: Expensive. Can be slow to autofocus. Chromatic aberration can be very pronounced.

★★★★⯪ 4.5

EF 100mm f/2.8L Macro IS USM

£635/$899/€864

An image stabilised macro telephoto lens ideal for precision close-up photography.

- Canon L-series high performance macro
- 4 stop Hybrid IS
- Life size image reproduction (1:1)
- UD lens element
- Water and dust resistant
- Three position distance limiter
- 9 blade circular aperture for beautiful bokeh
- Ring type USM AF motor
- Optional tripod collar

Pros: A sharp, solid, versatile macro lens. Fast max aperture and well balanced.
Cons: Quality control issues raised. AF reported as slow or even fails to lock.

★★★★⯪ 4.5

EF 300mm f/2.8L IS II USM

£4799/$6099/€6531

A high performance telephoto lens ideal for all types of sports or action photography.

- 300mm f/2.8 high-performance super-telephoto lens
- Part of Canon's acclaimed L series
- Durable, rugged and lightweight
- 4 stop Image Stabiliser
- Enhanced image quality
- 3 IS modes
- Quiet and fast autofocus
- 16 elements in 12 groups

Pros: Incredible tack sharp images. Perfectly suited to demanding environments.
Cons: As good as it is, you cannot overlook the enormous price tag. For the pros.

★★★★★ 5.0

EF 400mm f/2.8L IS II USM

£7698/$9999/€10477

Ultra-high performance, fast telephoto with image stabilisation and USM focusing.

- 400mm f/2.8 ultra-high-performance super-telephoto lens
- Part of Canon's acclaimed L series
- 4 stop Image Stabiliser
- 3 IS modes
- Durable, rugged design
- Enhanced image quality
- Quiet and fast autofocus
- 16 elements in 12 groups

Pros: Incredible performance and image quality. Sharp even at f/2.8. Highest quality optics.
Cons: Staggering price tag. Reports that it is slow to focus with x2 extenders.

★★★★⯪ 4.5

EF 600mm f/4L IS II USM

£8895/$11499/€12107

The ultimate high-speed super telephoto lens, used by pro sports photographers.

- Fluorite and UD elements
- Fast f/4 max aperture
- Ring-type USM for fast AF
- 4-stop Image Stabiliser
- Protective fluorine coating
- 4.5m min focus
- 9 blade aperture
- Power focus for video
- Dust and moisture resistant

Pros: Focus is fast and sharp, even with a teleconverter. Lighter than the previous version.
Cons: Stories of the lens handle breaking under the weight of the lens. Very expensive.

★★★★★ 5.0

EF zoom lenses

Enjoy the flexibility to change your framing to match your vision

EF 11-24mm f/4L USM

£2699/$2799/€2549

The best in ultra-wide-angle photography.

- Minimum focusing distance of 11 in./0.28m
- 9 diaphragm blades
- 16 element in 11 groups
- The widest angle rectilinear zoom lens
- Minimal distortion for architecture
- Advanced lens coatings
- Swift, nearly silent AF

Pros: Astonishing scope and quality. Superb sharpness, colour rendition, and contrast.

Cons: Colour fringing reported at 11mm. Sigma's 12-24 might be an alternative. Heavy.

★★★★☆ 4.0

EF 8-15mm f/4L Fisheye USM

£912/$1249/€1241

A versatile fisheye zoom lens.

- Circular or full-frame Fisheye zoom lens
- Part of Canon's acclaimed L series
- Durable and rugged design
- Quiet and fast autofocus
- Full-time manual focusing
- Easier lens cleaning
- 14 elements in 11 groups

Pros: Circular and diagonal fisheye options. Excellent L series build quality.

Cons: Very expensive for a fisheye lens. Lens cap fit is suspect. Ghosting around 15mm.

★★★★½ 4.5

EF 16-35mm f/2.8L III USM

£1899/$1999/€2242

With new optics and amazing sharpness.

- Fast constant f/2.8 aperture
- 16 elements in 11 groups
- 9 diaphragm blades
- Minimum aperture f/22
- Minimum focusing distance 0.28m
- Robust, weather sealed construction
- Advanced ring type USM motor

Pros: Sharper corner to corner than the lens it replaced. Light but sturdy. Versatile.

Cons: Heavy vignetting apparent when wide open. Not a jack-of-all-trades landscape lens.

★★★★½ 4.5

EF 17-40mm f/4L USM

£549/$799/€747

A lightweight and affordable ultra-wide zoom.

TOP PICK

- Superb optical performance throughout the zoom range
- Fast autofocus speed
- Highly resistant to dust and moisture
- 28cm minimum focusing distance at all focal lengths
- 12 elements in 9 groups

Pros: Quality L series lens. Incredible image quality and fast focusing. Relatively inexpensive.

Cons: Distortion reported at 17-20mm focal lengths. Copies seem to suffer softness issues.

★★★★½ 4.5

EF 24-70mm f/2.8L II USM

£1499/$1749/€1699

It's the perfect lens for any full-frame camera.

- Nine blade circular aperture
- Manual focus override
- Fast, quiet autofocus
- Sealed against dust and moisture
- 0.38m close focus
- Fast f/2.8 max. aperture
- All new optical design

Pros: Superb, almost perfect optics. Fast, silent, and accurate autofocus. Quality build.

Cons: Vignetting around 50-70mm at f/2.8. No image stabilisation. Expensive.

★★★★☆ 4.0

EF 24-70mm f/4L IS USM

£689/$999/€937

With fixed f/4 aperture and close macro focus.

- Versatile zoom range
- Macro mode for up to 0.7x magnification
- Up to four-stop Image Stabiliser
- Two aspherical and two UD lens elements
- Fast ultrasonic AF
- Sealed against dust and moisture
- Nine-bladed aperture for soft bokeh

Pros: Very sharp, compact, and light. Macro mode can be very useful. Impressive four stop IS.

Cons: Heavy vignetting apparent. Back-focusing issues for some. May need calibration.

★★★★☆ 4.0

EF 24-105mm f/4L IS II USM

£1029/$1099/€1208

One of the great all-rounders. Perfect for landscapes, portraits, sports and more.

- Superb L-series optical performance
- 17 elements in 12 groups
- 4 glass-moulded (GMo) aspherical lenses
- 10-blade circular aperture
- Improved IS system for better handheld performance
- Up to 4 stops of shake reduction
- Improved edge-to-edge results with reduced distortions

Pros: Very versatile lens. Controls vignetting very well. Effective four stop IS.
Cons: May not be worth the upgrade if you have the original. Could have been sharper.

★★★★☆ 4.0

EF 70-200mm f/2.8L IS II USM

£1524/$2099/€2074

A rugged and dependable fast telephoto zoom, with 4-stop image stabilisation.

- High-performance, L-series telephoto zoom lens
- Constant maximum aperture of f/2.8
- Four-stop Image Stabiliser
- Fluorite and UD lens elements
- Improved durability
- 1.2m minimum focussing
- Water and dust resistant
- Ring type USM AF motor

Pros: Very sharp wide open, and even sharper at f/4. Good colour rendition and great contrast.
Cons: Not as sharp at the close focus distance. Now superseded by the IS III USM.

★★★★★ 5.0

EF 70-300mm f/4-5.6 IS II USM

£449/$499/€549

Another great all-rounder perfect for portraits, landscapes, sports and more.

- Get closer to distant subjects
- Compatible with all EOS cameras
- A portable design you can take anywhere
- Weighs just 710g
- Unique Lens Information Display
- Nano USM AF also delivers smooth focus
- 4 stop Image Stabiliser
- Superior image quality and sharpness
- 9 bladed lens diaphragm

Pros: Fast autofocus. Improved image stabilisation. Portable, with good image quality.
Cons: Not fully weather sealed. Lens hood an option. Degraded image quality in highlights.

★★★★☆ 4.0

EF 70-300mm f/4-5.6L IS USM

£899/$1349/€1223

A robust and compact image-stabilised telephoto zoom offering superb image quality.

- High performance telephoto zoom lens
- Part of Canon's acclaimed L series
- 4 stop Image Stabiliser
- Two UD elements
- Highly resistant to dust and water
- 8 blade circular aperture
- Quiet & fast autofocus
- Compatible with a tripod collar

Pros: Sharp as they come, with good contrast. Quick and accurate AF. Nice bokeh.
Cons: Focus is a bit slow. Quite heavy and bulky. Variable aperture. Expensive.

★★★★⯪ 4.5

Canon EF 70-200mm f/2.8L IS III USM

£2000/$2100/€2499

One of the most versatile lenses available with advanced optics.

- Constant maximum aperture of f/2.8
- 3.5-stop image stabilisation
- 23 elements in 19 groups
- Maximum aperture f/2.8
- Minimum aperture f/32
- 8 rounded diaphragm blades.
- 77mm filter size
- Air Sphere coating
- Water and dust resistant

Pros: Bright constant f/2.8 maximum aperture. Improved image stabilisation. Sharp and fast.
Cons: Very heavy for its size. Reports of softness in low light. The IS II remains good value.

★★★★⯪ 4.5

EF 100-400mm f/4.5-5.6L IS II USM

£1778/$2049/€1906

You can't go wrong with this high performance super-telephoto zoom.

- Versatile, portable super-telephoto zoom lens
- Superb image quality right across the frame
- 4 stop Image Stabiliser
- Customise the zoom control
- Fast, near silent focusing
- Shoot confidently in tough weather conditions
- Focuses down to 0.98m

Pros: Good sharpness and excellent build quality. Low chromatic aberration, low distortion.
Cons: More expensive than the old 100-400mm. IS can lag a little. Very heavy.

★★★★⯪ 4.5

Tilt-shift lenses and extenders

Control your perspective or extend your reach with special lenses and adapters

CANON LENS TS-E 135mm 1:4 L MACRO
Canon
TS-E 135mm

TS-E 17mm f/4L

£1799/$2149/€2699

A specialist wide angle tilt-shift lens for distortion free architectural photography.

CANON LENS TS-E 17mm 1:4 L
Canon
TS-E 17mm

- Ultra-wide 17mm tilt and shift lens
- Low distortion and high resolution
- 6.5° tilt and 12mm shift
- Independent tilt or shift rotation
- Aspherical and UD lens elements
- Subwavelength Structure and Super Spectra coatings
- Circular aperture
- 18 elements in 12 groups

Pros: A unique use lens. Great sharpness and overall image quality. Low distortion.
Cons: Filters cannot be used on it. Very expensive. No protection for the front element.

★★★½☆ 3.5

TS-E 24mm f/3.5L II

£1579/$1899/€1782

A wide range of movement for expanded possibilities of tilt-shift photography.

CANON LENS TS-E 24mm 1:3.5 L II
Canon
TS-E 24mm

- Low distortion and high resolution
- 8.5° tilt and 12mm shift
- Independent tilt and shift movements
- Aspherical and UD lens elements
- Subwavelength Structure and Super Spectra coatings
- Circular aperture
- High precision, large diameter moulded glass aspherical lens element

Pros: Almost no visible distortion. Excellent central sharpness. Flexible perspective control.
Cons: Learning curve to using tilt-shift lenses to best effect. Heavy and expensive.

★★★★☆ 4.0

TS-E 45mm f/2.8

£1199/$1399/€1470

An angle of view similar to a standard 50mm lens for natural looking perspectives.

- 45mm tilt and shift lens
- Natural perspective with image control
- 8° tilt and 11mm shift
- Rear focusing system
- Non-rotating front element
- Sharp images from 0.4m to infinity
- Super Spectra coatings ensure accurate colour balance
- 10 elements in 9 groups

Pros: A sharp lens with a very solid build quality. Focus rotation smooth. Great optics.
Cons: Expensive. Issues with focussing at infinity. Manual focus only. Requires manual exposure.

★★★★☆ 4.0

Canon TS-E 50mm f/2.8L Macro

£2199/$2261/€2469

A specialist L-series prime lens with perspective control.

- Macro ratio 1:2 life size
- 50mm full-frame lens
- f/2.8 maximum aperture
- f/32 minimum aperture
- 12 elements in 9 groups
- 9 diaphragm blades
- 46° diagonal angle of view
- ffl 8.5° Tilt and ffl12mm Shift
- Closest focusing distance 0.273m

Pros: Excellent sharpness. Very low distortion. Low chromatic aberration. No flare.
Cons: A very expensive lens with possible limited use. Bulky and heavy. No full rotation.

★★★★⯪ 4.5

Canon TS-E 90mm f/2.8L Macro

£2199/$2199/€2469

Perspective control for beautiful portraits and product images.

- Macro ratio 1:2 life size
- 90mm full-frame lens
- f/2.8 maximum aperture
- f/45 minimum aperture
- Distance information
- 11 elements in 9 groups
- 9 diaphragm blades
- 27° diagonal angle of view
- Closest focusing distance 0.39m

Pros: Excellent sharpness. Very low distortion. Low chromatic aberration. Quality build.
Cons: An expensive lens with a learning curve to reveal its best potential. Bulky and heavy.

★★★★☆ 4.0

TS-E 90mm f/2.8

£1344/$1399/€1472

Suitable for a variety of subjects, from product photography to architecture.

- 90mm tilt and shift lens
- Telephoto lens with image control
- 8° tilt and 11mm shift
- 58mm filter size
- Non-rotating front element
- Featuring six elements in five groups
- Super Spectra coatings reduce flare and ghosting
- 11 elements in 9 groups

Pros: Very sharp lens for a non-L series product. Can use a filter. Almost zero chromatic aberration.
Cons: Locking knobs are small and fiddly. More degrees of tilt and shift would have been nice.

★★★★⯪ 4.5

Extender EF 1.4x III

£359/$429/€478

Ideal for sports and nature photography. Increase the focal length of lenses by 1.4x.

Canon
EXTENDER EF 1.4× III
1.4×

- Extends the master lens focal length by 1.4x
- Outstanding image quality
- Highly resistant to dust and water
- Improved communication between lens and camera
- Optimised lens coatings
- Compatible with L-Series telephoto and telephoto zoom lenses

Pros: Lovely image quality. Lightweight and portable. Superb build quality. IS lenses still work.
Cons: Expensive compared to others. Limited to certain lenses. Can reduce image contrast.

★★★⯪☆ 3.5

Extender EF 2x III

£389/$499/€489

Like the extender 1.4x version but this can increase the focal length by a factor of 2x.

Canon
EXTENDER EF 2× III
2×

- Extends the master lens focal length by 2x
- Outstanding image quality
- Highly resistant to dust and water
- Improved communication between lens and camera
- Optimised lens coatings
- Compatible with L-Series telephoto and telephoto zoom lenses

Pros: Highly resistant to dust and water. Extends the focal length by 2x. Improved AF performance.
Cons: It is not compatible with ALL EF lenses. Expensive compared to third party options.

★★★⯪☆ 3.5

EOS RF lenses

Begin your journey into the world of full-frame mirrorless photography

Canon RF 35mm f/1.8 IS Macro STM

£520/$499/€584

A versatile high-quality 35mm lens for the EOS R mirrorless system.

- Maximum aperture of f/1.8
- 5 stops image stabilisation
- 11 elements in 9 groups
- 9 diaphragm blades
- Closest focusing distance 0.17m
- 63° diagonal angle of view

Pros: Fast AF system. Amazing build quality. Great sharpness with sharp corners wide open.
Cons: Not a true 1:1 macro lens. Some vignetting visible. Noisy AF motor. Some distortion visible.

★★★★½ 4.5

Canon RF 50mm f/1.2L USM

£2350/$1550/€2641

Amazing optical clarity and performance for your full-frame photography.

- Maximum aperture of f/1.2
- 15 elements in 9 groups
- 10 diaphragm blades
- Closest focusing distance 0.4m
- 46° diagonal angle of view
- Distance information

Pros: Superb sharpness, even at widest aperture. Very fast AF. Very low chromatic aberration.
Cons: A large and heavy lens. Very expensive. Some vignetting apparent at widest apertures.

★★★★★ 5.0

Canon RF 24-105mm f/4L USM

£1120/$1800/€1258

A flexible lens for portraits, landscapes and creative film making.

- Maximum aperture of f/4
- 18 elements in 14 groups
- 9 diaphragm blades
- Closest focusing distance 0.45m
- 84° - 23° diagonal angle of view
- 5 stop image stabilisation

Pros: Five stops of image stabilisation. Customisable control ring. Impressive sharpness.
Cons: Expensive for an f/4 zoom. Some fringing is apparent. Some barrel and pincushion distortion.

★★★★½ 4.5

Canon RF 85mm f/1.2L USM

£2687/$2699/€2999

An L series prime lens with incredible low light performance.

- Maximum aperture of f/1.2
- Smooth, fast, USM motor
- 13 elements in 9 groups
- 9 diaphragm blades
- Closest focusing distance 0.85m
- 28° diagonal angle of view

Pros: Fast autofocus. Highest build quality and performance. Impressive sharpness across the range.
Cons: Not image stabilised. Very big and heavy on the EOS R. Very expensive lens.

★★★★½ 4.5

Canon RF 28-70mm f/2L USM

£3050/$4800/€3428

An amazing quality f/2 advanced L-series wide-angle zoom lens.

- Maximum aperture of f/2
- Minimum aperture of f/22
- 19 elements in 13 groups
- Closest focusing distance 0.39m
- 75° - 34° diagonal angle of view
- Distance information

Pros: Superb image quality. Extremely versatile all-rounder. Fast aperture. Weather sealed.
Cons: Not image stabilised. Needs a tripod collar. Very big, bulky, and expensive lens.

★★★★½ 4.5

RF 24-240mm f/4-6.3 IS USM

£899/$899/€989

A very versatile 10x zoom for EOS full-frame cameras.

- Nano USM AF system
- Maximum aperture f/4 to f/6.3
- Closest focusing distance 50cm
- Image stabilisation
- 21 elements in 15 groups
- 7 diaphragm blades

Pros: Versatile zoom range for travel photography. Weighs only 750g.
Cons: Variable aperture slow around 100mm. Noticeable chromatic aberration.

★★★★½ 4.5

RF 15-35mm f/2.8L IS USM

£2329/$2299/€2629

A useful, large, constant aperture, wide-angle zoom lens.

TOP PICK
Canon
15-35

- Wide-angle zoom lens
- Maximum aperture f/2.8
- Minimum aperture f/22
- 110° to 63° angle of view
- Maximum magnification 0.21x
- Closest focusing distance 28cm
- 16 elements in 12 groups
- 9 diaphragm blades
- Weight 840g

Pros: 5 stops of image stabilisation. Very low distortion. Fast focusing.
Cons: Hugely expensive. Large, bulky lens. Edge sharpness is below par.

★★★★★ 5.0

Canon RF 24-70mm f/2.8L IS USM

£2399/$2299/€2700

A high image quality and bright maximum aperture zoom lens.

- Wide-angle to portrait length zoom
- Maximum aperture f/2.8
- Minimum aperture f/22
- 84° to 34° angle of view
- Maximum magnification 0.3x
- Closest focusing distance 21cm
- 21 elements in 15 groups
- 9 diaphragm blades
- Weight 900g

Pros: 5 stops of image stabilisation. Quiet focusing. Very sharp around f/8.
Cons: A big price tag. Edge sharpness is reported as average.

★★★★⯪ 4.5

Drop-in Filter Mount Adapter EF-EOS R

£220/$239/€240

Drop-in Filter Mount Adapter EF-EOS R takes the functionality of Mount Adapter EF-EOS R and adds the ability to use drop-in filters.

Canon
DROP-IN FILTER MOUNT ADAPTER EF-EOS R

Clear Drop-in Filter

A clear filter, for users who have bought the drop-in filter adapter but who do not wish to have any filter effects.

Circular Polariser

A circular polarising filter which boosts colour, contrast and saturation, and controls unwanted reflections.

Variable ND

A neutral density filter controlling exposure in movies and prolonging shutter speeds for a variety of creative movement effects.

Pros: A useful addition when teamed with L series lenses on the EOS R body. Saves on a lot of filters.
Cons: Filter adjustment wheel very sensitive. Does not support RF lenses, only EF lenses.

★★★★☆ 4.0

Mount Adapter EF-EOS R

£99/$99/€129

The standard Mount Adapter EF-EOS R allows EF-S and EF lenses to be used on EOS R cameras.

Canon
MOUNT ADAPTER EF-EOS R

Pros: Works flawlessly for connecting existing EF and EF-S glass. Retains full AF.
Cons: The most basic adapter Canon offers for the EOS R. Lacking in features.

★★★★☆ 4.0

Control Ring Mount Adapter EF-EOS R

£179/$199/€199

Control Ring Mount Adapter EF-EOS R offers the same lens mount conversion as Mount Adapter EF-EOS R but also adds a Lens Control Ring.

Canon
CONTROL RI

Pros: Sturdy build quality. Adds programmable control ring function. Good weather sealing.
Cons: Suddenly double the price for one added feature. Control ring fiddly in use.

★★★⯪☆ 3.5

Canon Speedlites

Flashes that will light up your creativity

Bring the light and take a step further in the world of creative photography; as you develop your skills as a photographer, you will discover the benefits of being in control of your own lighting to really express your creative vision. Using your own lighting equipment is how you elevate your work above those who shoot with ambient light. Using your own lighting schemes allows you to produce a distinctive look that cannot be achieved any other way. Whenever you are using a flash to simply fill in dark shadows on a bright day or using a multiple light setup to bring life to a dark setting, the Canon Speedlite range of flashes will give you all the creative control you need.

Use them mounted to the hot-shoe of your camera or use a wireless triggering system with a number of off camera flashes to get even more impact and visual drama. From small, simple but effective flashguns for EOS M cameras, to the top of the range models that are powerful and packed with impressive features, there is going to be something that suits your needs. If you require versatility and creative control of your photography, it can be dome in a flash! ■

SPEEDLITE
470EX-AI
AI.B
ETTL
Zoom 50mm
SUB MENU
LOCK ON OFF
ZOOM
SEL/SET
MODE
LOCK
AF-ON
START STOP
MENU
INFO
SET
LOCK

Canon Speedlite 600EX II-RT

£537/$499/€629

Powerful top of the range professional Speedlite, packed with advanced features.

TOP PICK
Canon

- E-TTLII/E-TTL exposure control
- Guide Number of 60 (m, ISO100)
- Transmitter range of 30m outdoors
- Metal hot-shoe foot
- Infrared/radio slave function
- Fast, quiet recycling
- Auto zoom for sensor size
- Bounce and swivel control

Pros: Powerful and versatile flash for creative shooting. Off-camera possibilities are endless.
Cons: Reports of incompatibility with older 600EX models and malfunctions cropping up.

★★★★☆ 4.0

Speedlite Transmitter ST-E3-RT

£239/$263/€325

A wireless flash trigger with 30m range, compatible with many Speedlite flashguns.

SPEEDLITE TRANSMITTER ST-E3-RT
CLEAR
LOCK ON OFF

- Radio frequency remote flash trigger
- Fire selected Speedlites from 30m away
- Controls up to 15 flashguns
- Remote camera triggering
- Weather sealed against dust and moisture
- Unlike IR transmitters does not need line of sight to operate

Pros: Easy to use and configure. Doesn't need line of sight. Weather sealed.
Cons: No focus assist beam. Does require a post 2012 camera for full functions.

★★★★☆ 4.0

Canon Speedlite 270EX II

£129/$139/€175

A powerful but easy-to-use flashgun. Use it on or off the camera with wireless control.

- Lightweight compact design
- Guide Number 27 (m, ISO100)
- Bounce flash head
- Wireless slave function
- Trigger your EOS camera with Remote Release button
- Variable angle of coverage
- Fast, silent recycling

Pros: A great compromise of power over size and portability. Very cost effective. Lightweight.
Cons: Does not have a test button. Not the most powerful flash around. Cheaper options around.

★★★½☆ 3.5

Canon Speedlite 320EX

£193/$215/€262

A versatile flash with a built-in LED video light, bounce-tilt head and wireless technology.

- Guide Number 32 (m, ISO100)
- Compact lightweight design
- Bounce-and-swivel flash head, with 24mm and 50mm zoom settings
- Integrated LED video light
- Wireless slave for off-camera TTL flash
- Remote Release button
- Fast, silent recycling

Pros: Includes an LED light for modelling. Very compact, with a decent guide number.
Cons: No focus assist beam. Doesn't support E-TTL metering. Expensive for what it is.

★★★½☆ 3.5

Speedlite EL-100

£199/$199/€222

Get started with flash and make better looking images easier than ever.

- Guide Number 26 (m, ISO100)
- Auto mode for simple flash shooting
- Bounce flash vertical and horizontal
- Optical sender/receiver for off-camera flash
- Zoom head
- High speed sync
- AF assist beam
- Minimum recycling time 5.8s

Pros: Great little flash to team with a smaller DSLR. Small, light, all-purpose unit.
Cons: Modelling is not supported on EOS R and M models of camera. Power might be lacking.

★★★★☆ 4.0

Canon Speedlite 430EX III-RT

£219/$249/€265

A powerful and advanced but easy to use on and off camera.

- E-TTLII/E-TTL exposure control
- Guide Number of 43 (m, ISO100)
- 24-105mm zoom head with 14mm wide panel
- Fast and silent recycling
- Metal hot-shoe foot
- 180 degree swivel head
- Infrared/radio slave function
- AF assist beam

Pros: A decently powerful guide number and excellent array of features. Very portable.
Cons: The IR assist only works with the centre AF point. This is a downgrade from the previous model.

★★★★½ 4.5

Speedlite 470EX-AI

£454/$349/€499

With a unique motorised bounce head that automatically adjusts to control shadows.

- Guide Number 47 (m, ISO100)
- Clear dot Matrix LCD
- Auto AI bounce function
- 14mm Lens coverage via adaptor
- Auto zoom for sensor size
- Infrared wireless flash
- AF assist beam
- 1-19 AF points supported

Pros: Automatically bounces flash output. Great for beginners. Good max output. Fast recycle.
Cons: It's an expensive option for beginners. No optical, or RF master and slave modes.

★★★★☆ 4.0

MR-14EX II Macro Ring Lite Flash

£499/$539/€559

Creative macro lighting control from camera or flash.

- E-TTLII/E-TTL exposure control
- Independently variable dual flash tubes for creative lighting control
- LED modelling lamps make composition and focusing easier
- Powerful performance with guide number 14 (ISO 100,m)
- Metal hot-shoe foot

Pros: A well-built and well-designed ring lite flash. Can be used as a portrait flash.
Cons: Does not support RF capabilities. Needs mount adapter. No directional control.

★★★★½ 4.5

The majesty of mono

Don't be a fair weather photographer. You don't always need a stunning sunrise or glorious sunny day to undertake a photography session. Sometimes, a grey day can give up the goods as well as any sunny day. It's just a case of approaching it from a different angle. If it is a lacklustre day, the shadows will be flat or non-existent and there will be very little contrast compared to a bright day. Make the most of form and texture instead. Also, perhaps you could shoot with the intent of doing a mono conversion such as the examples seen here.

UNDERSTAND YOUR CAMERA

Our guide to some photographic essentials

Modern Canon cameras are marvels of miniaturised technology, with many automatic functions to help you take good photos in a wide range of different situations. However by learning more about how your camera works and how to use its many features you can expand the scope of your photography and get good results every time, even in difficult conditions. For owners of more advanced DSLRs there are options such as aperture and shutter speed control, sensitivity and white balance, as well as creative light metering modes and manual focusing, all of which can be used creatively to make your photos really stand out.

Photography is a rewarding and potentially profitable hobby, and the more you learn about it the more you'll get out of it. Read on and find out a bit more about how that expensive gadget you bought actually works and some of the main principles behind photography. ■

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White may not as white as you think

Shooting modes

Getting in the right mode for the right situation

All but the most basic budget compact cameras have a selection of shooting modes, usually chosen by a dial on the top or back of the camera. Easy-to-use, mainly automatic cameras in the range will only have a few shooting modes, while the more sophisticated cameras such as the EOS DSLRs may have as many as a dozen, including manual exposure options and user-programmable special settings.

As newer models appear in the range or older models are updated, the shooting modes available will be revised and possibly expanded. Shown on this spread are some of the most often used modes selected from the mode dial on the top of the camera. ■

Auto DOF Mode: As you focus on your subject, the camera will use the other focus points to measure the distance of the other objects in the viewfinder. It will determine what the appropriate aperture setting should be to render everything in focus.

A-DEP
M
Av
Tv
P
CA
A-DEP

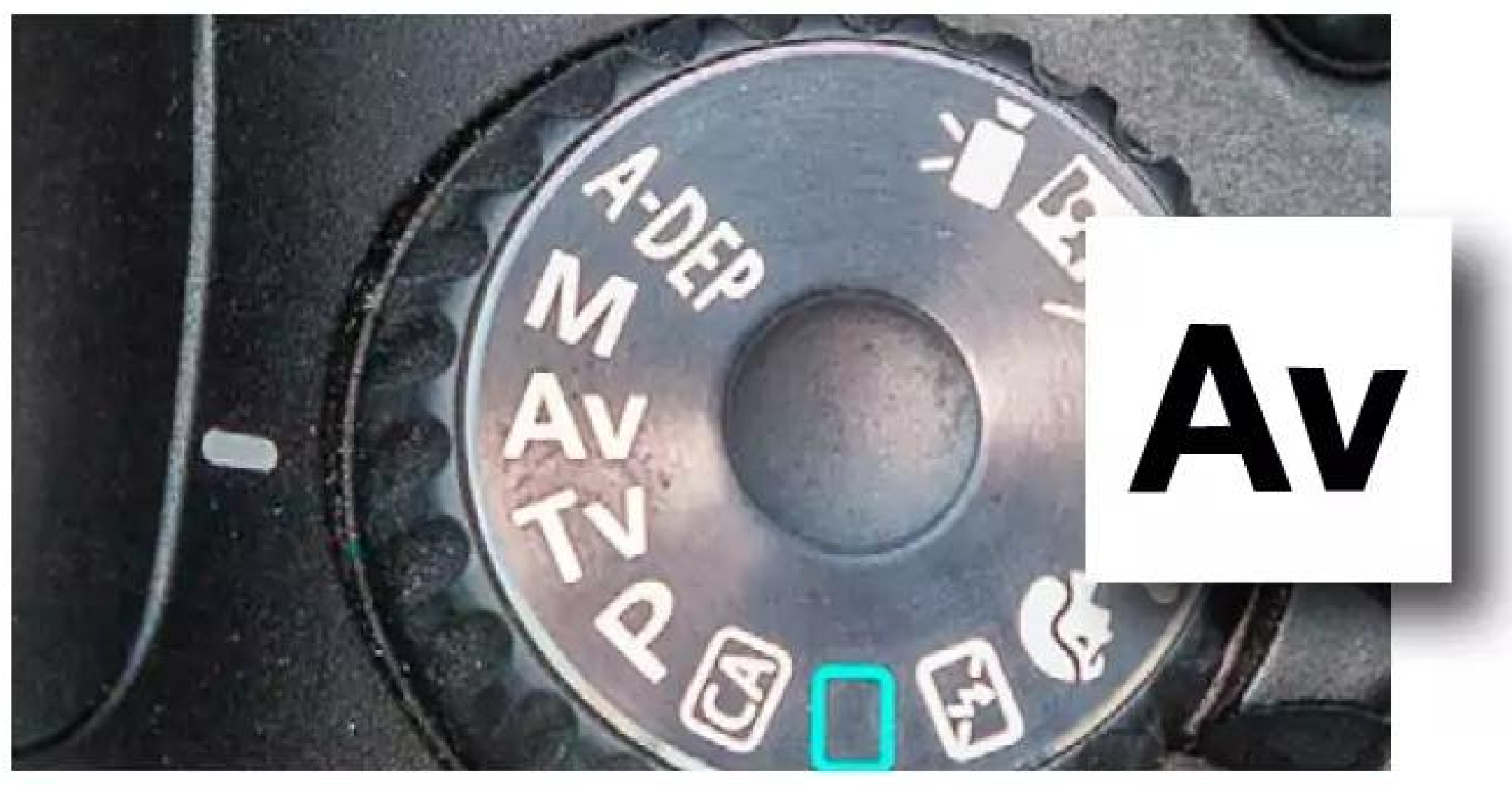
Bulb Mode: Lets you control both shutter speed and lens aperture independently. Instead of a fixed shutter speed, many cameras in the range offer a Bulb shutter, allowing long exposures for as long as you hold the Shutter button down.

BULB
F6.3
ISO 100
M
AWB
RAW
ONE SHOT
B

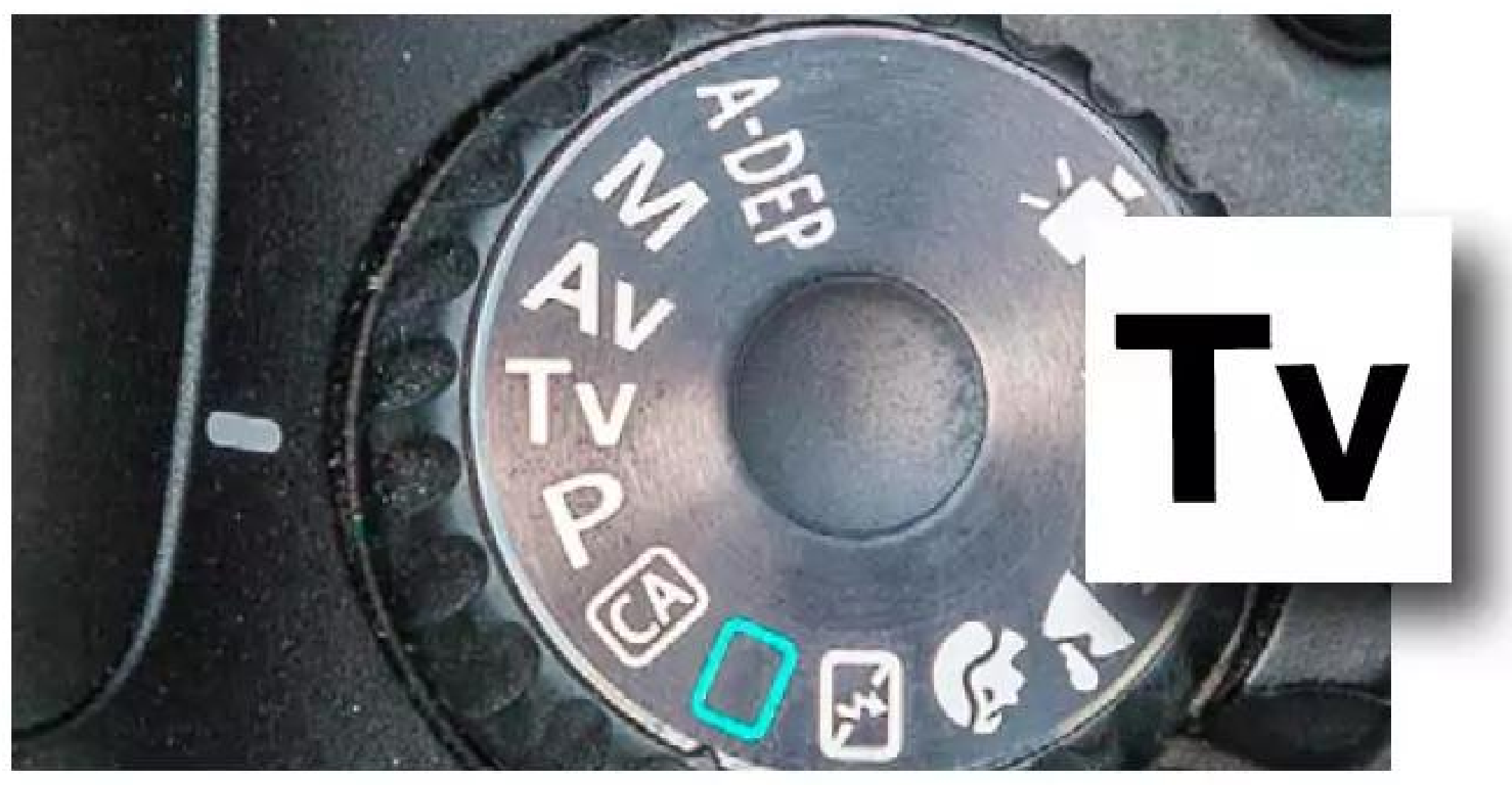
Manual Exposure: This mode provides the same range of exposure control as the other shooting modes, but lets you control both shutter speed and lens aperture independently for more creative control.

A-DEP
M
Av
Tv
P
CA
M

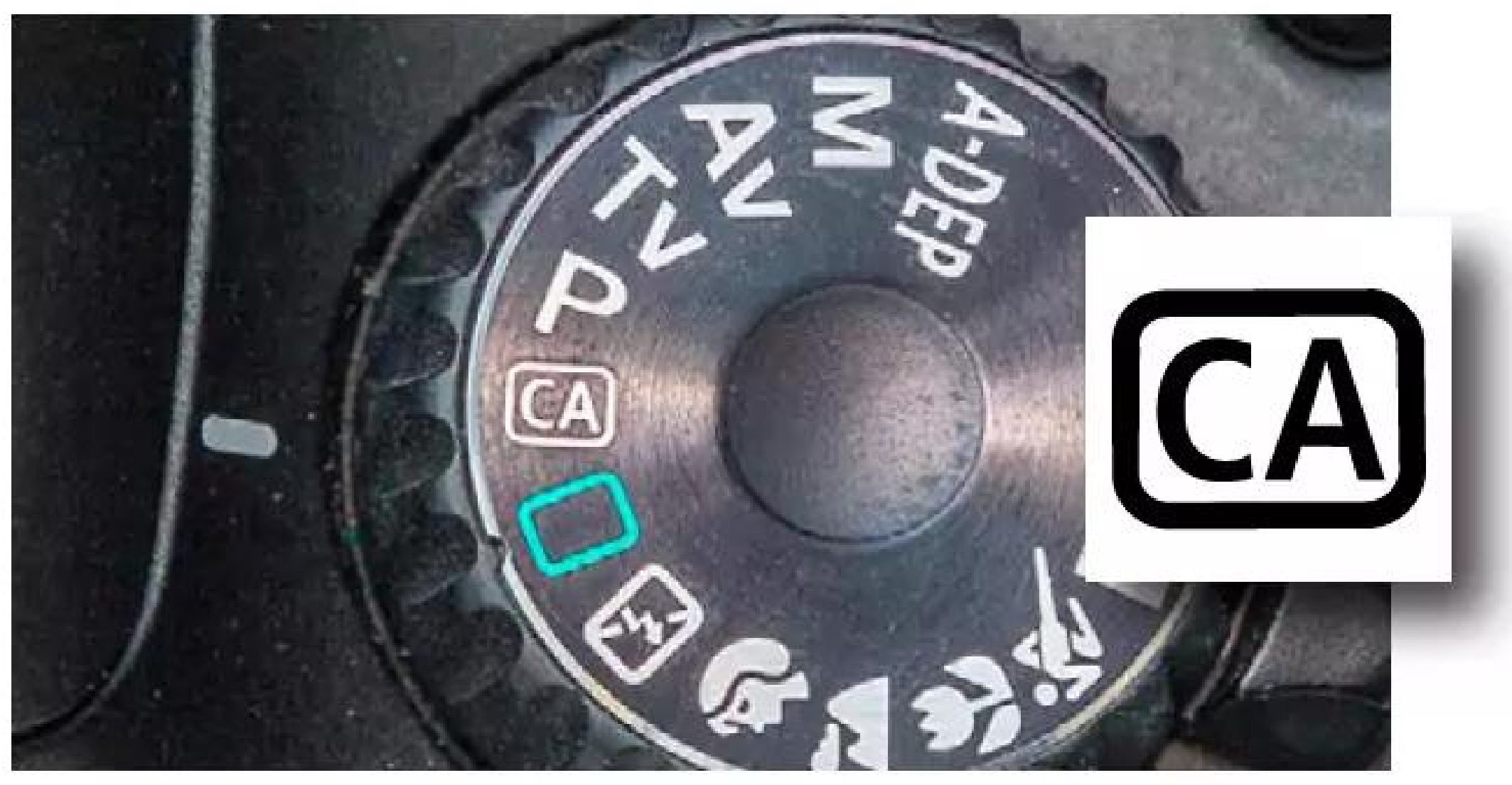
Aperture-Priority AE: This allows you to set the lens aperture, while the camera is left to select the most appropriate shutter speed. You have control over all the other exposure variables, including the control of exposure compensation.



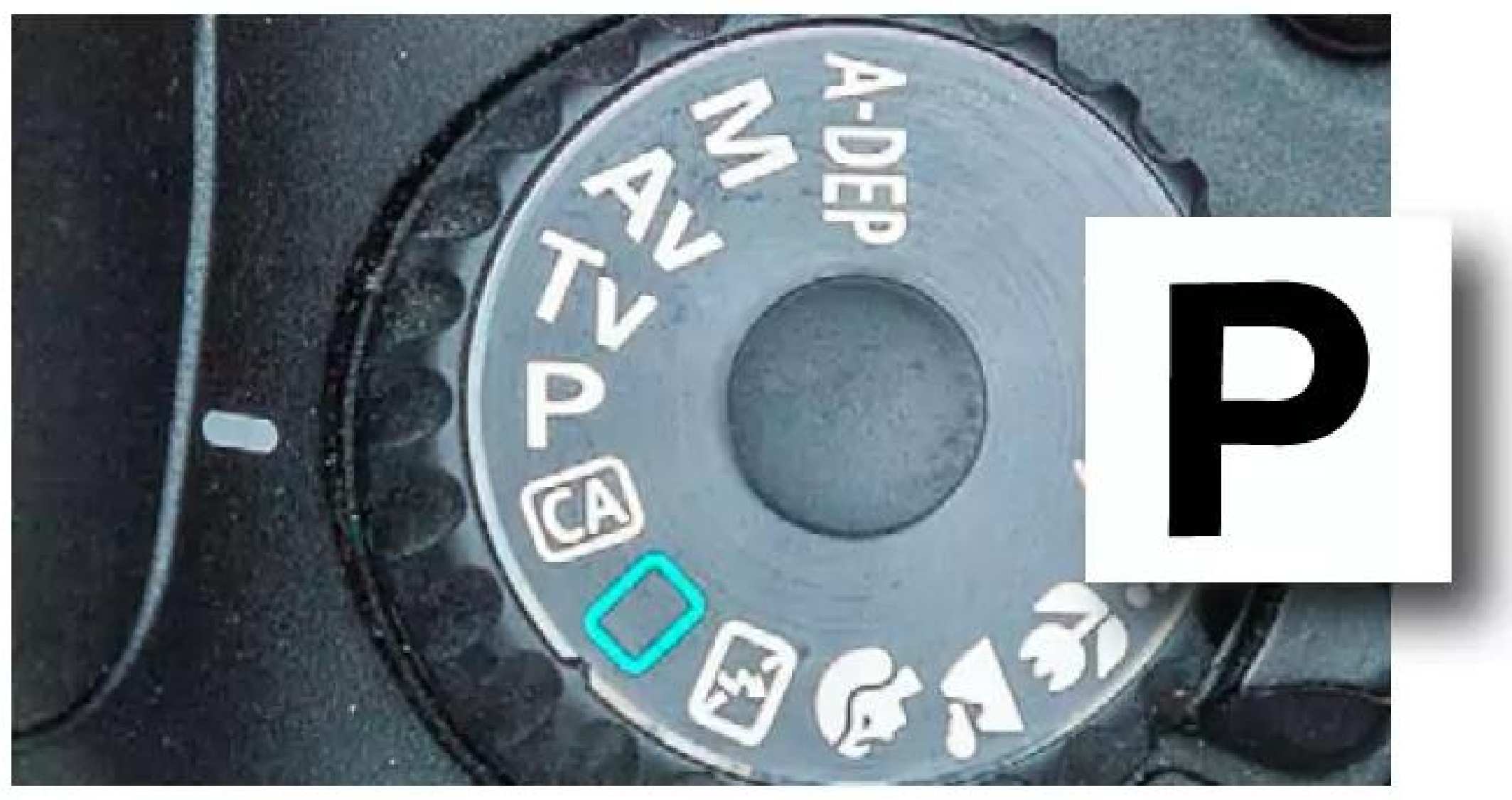
Shutter-Priority AE: You can manually set the shutter speed you want to work with, while the camera chooses the best corresponding aperture setting. You have control over all other exposure variables, including exposure compensation.



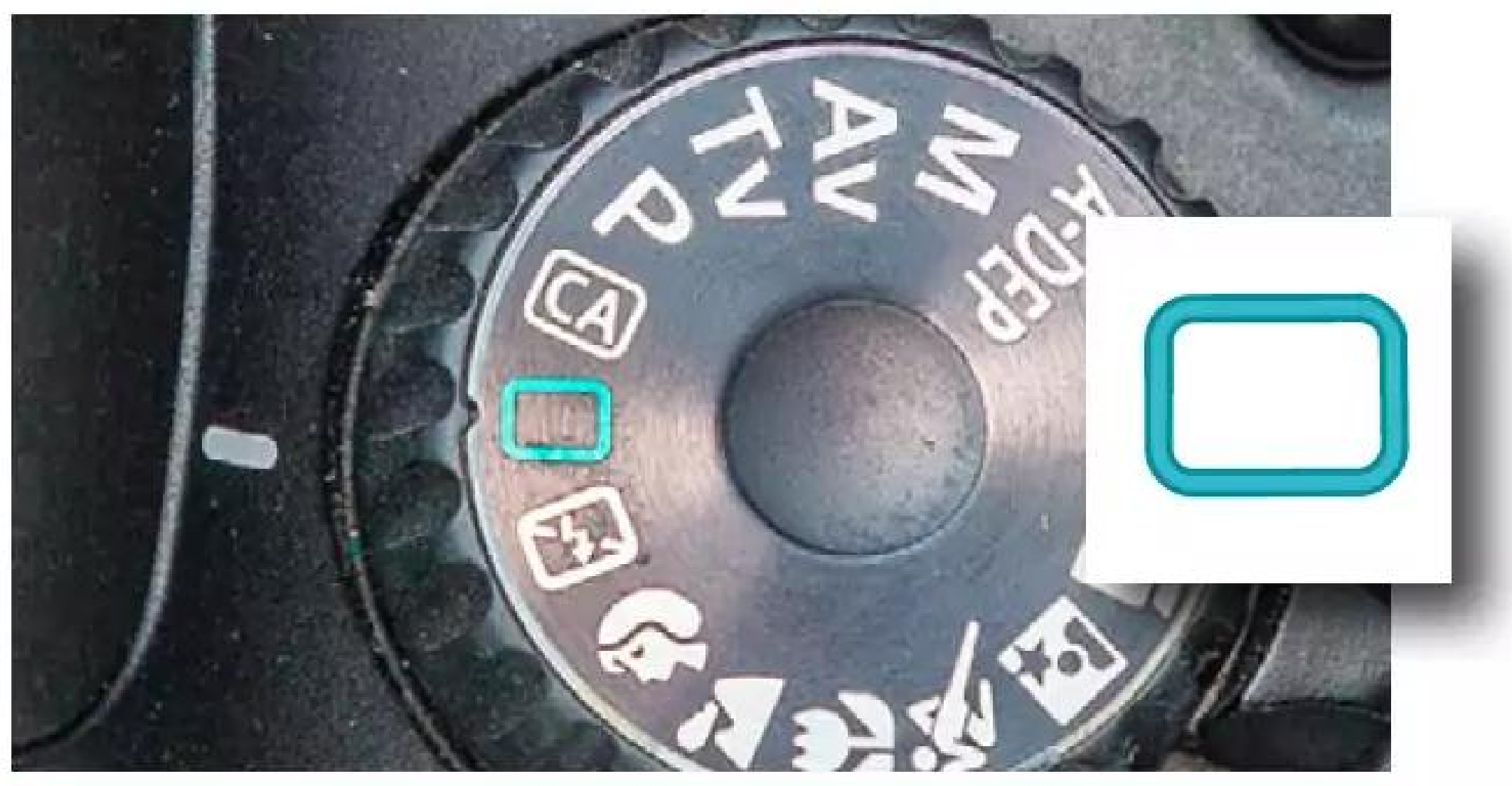
Creative Auto Mode: When set to CA mode, the camera allows the user to adjust picture style, motor drive, and exposure compensation, as well as to use the program shift function.



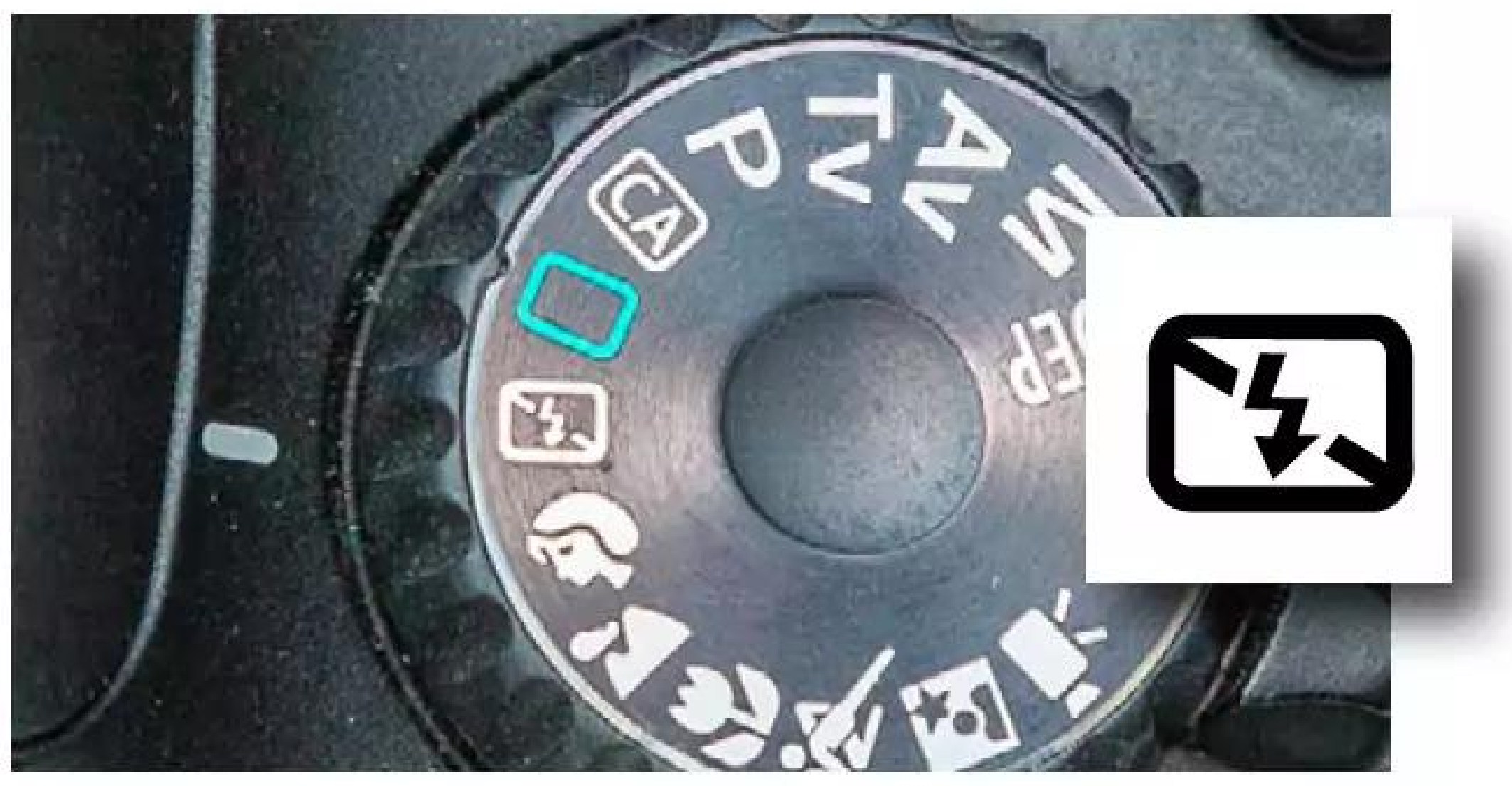
Program AE: Similar to the Full Automatic mode, but allows more control over the exposure variables. Aperture and shutter speed are automatically selected by the camera, but you can alter exposure to different apertures by turning the Main dial.



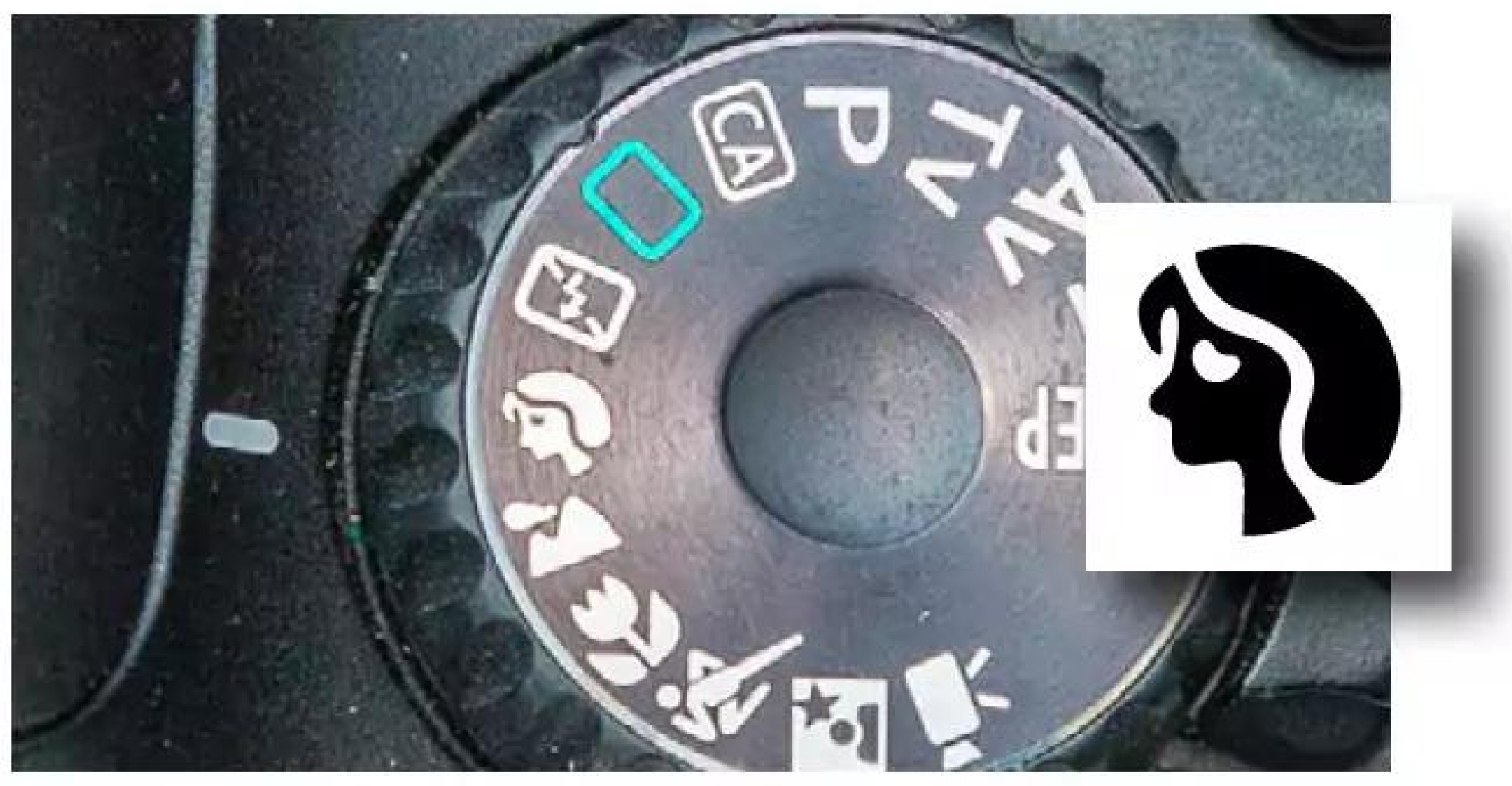
Full Automatic Mode: Full Automatic is indicated on the Mode dial by a green rectangular outline. In this mode, the camera makes all exposure decisions with the exception of image quality. Autofocus mode is set to AI Focus.



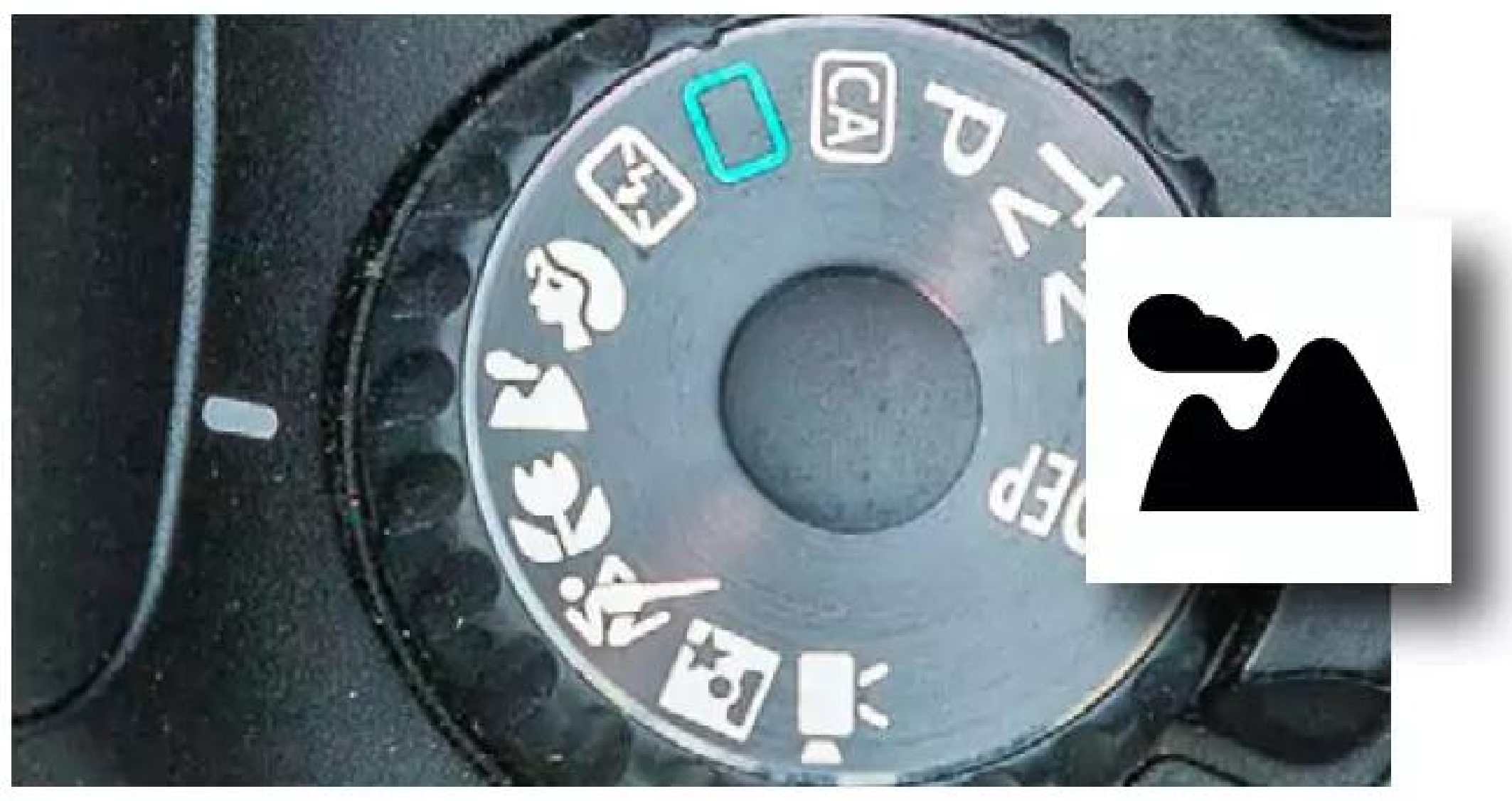
Flash Off Mode: Flash Off mode disables both the internal flash head and any external flash unit connected. Focus is set to AI Focus mode, the AF assist lamp disabled. ISO and white balance are set automatically as well.



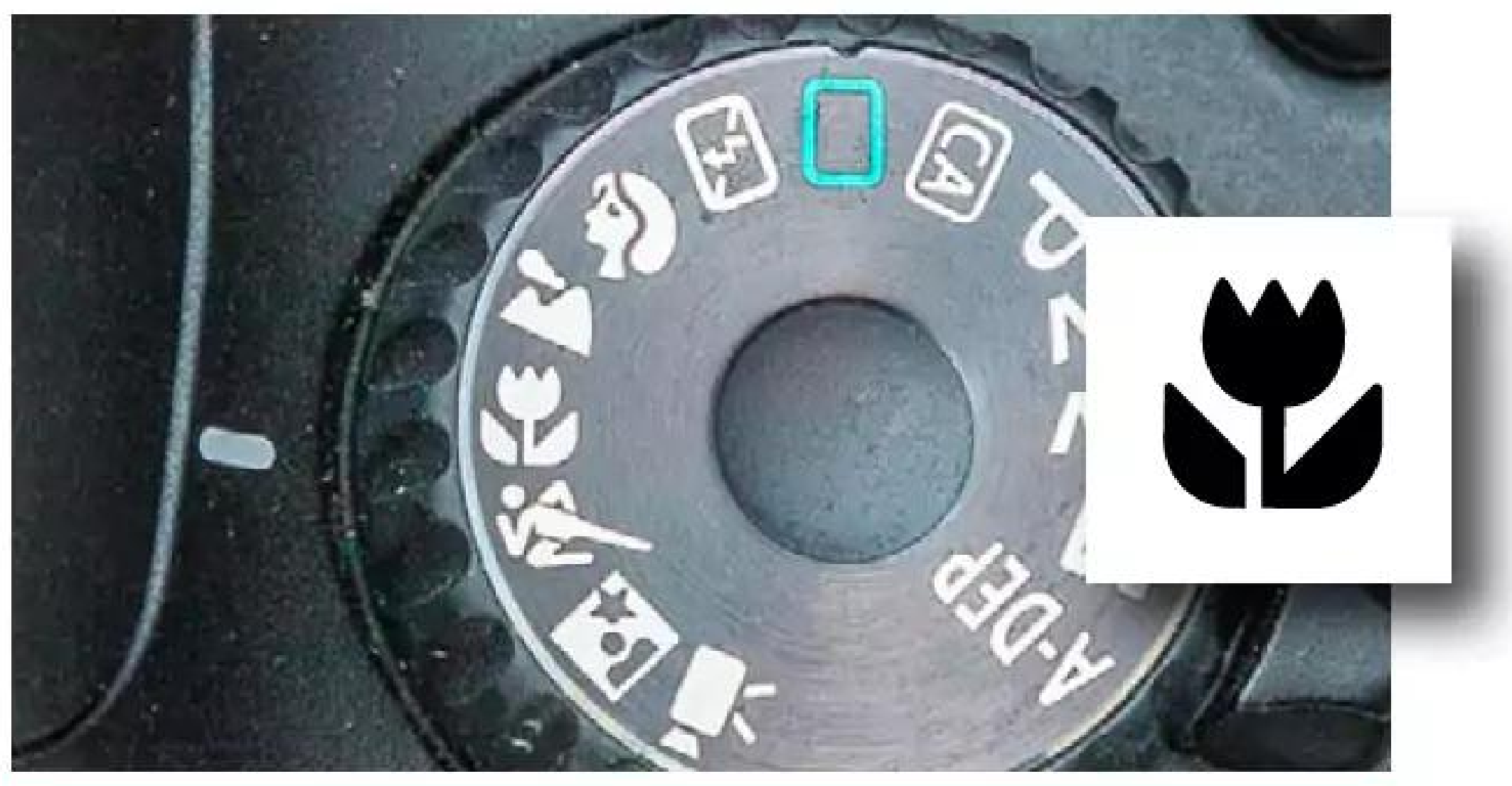
Portrait Mode: This mode uses a large aperture setting to decrease the depth of field, which blurs the background to emphasize the subject. ISO and white balance are set to Auto.



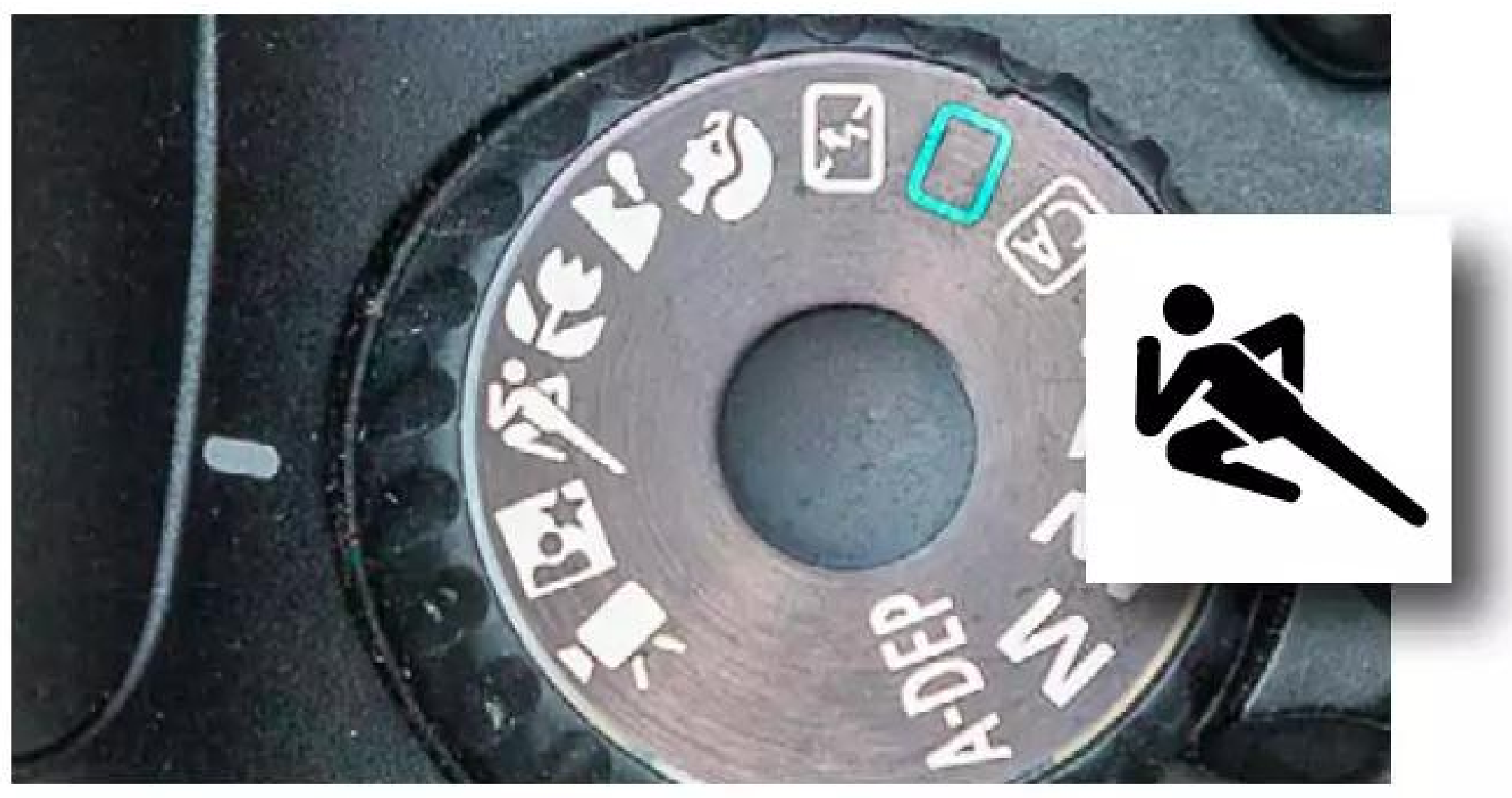
Landscape Mode: Landscape mode combines slower shutter speeds with smaller aperture settings to increase the depth of field when shooting broad panoramas and sweeping landscapes.



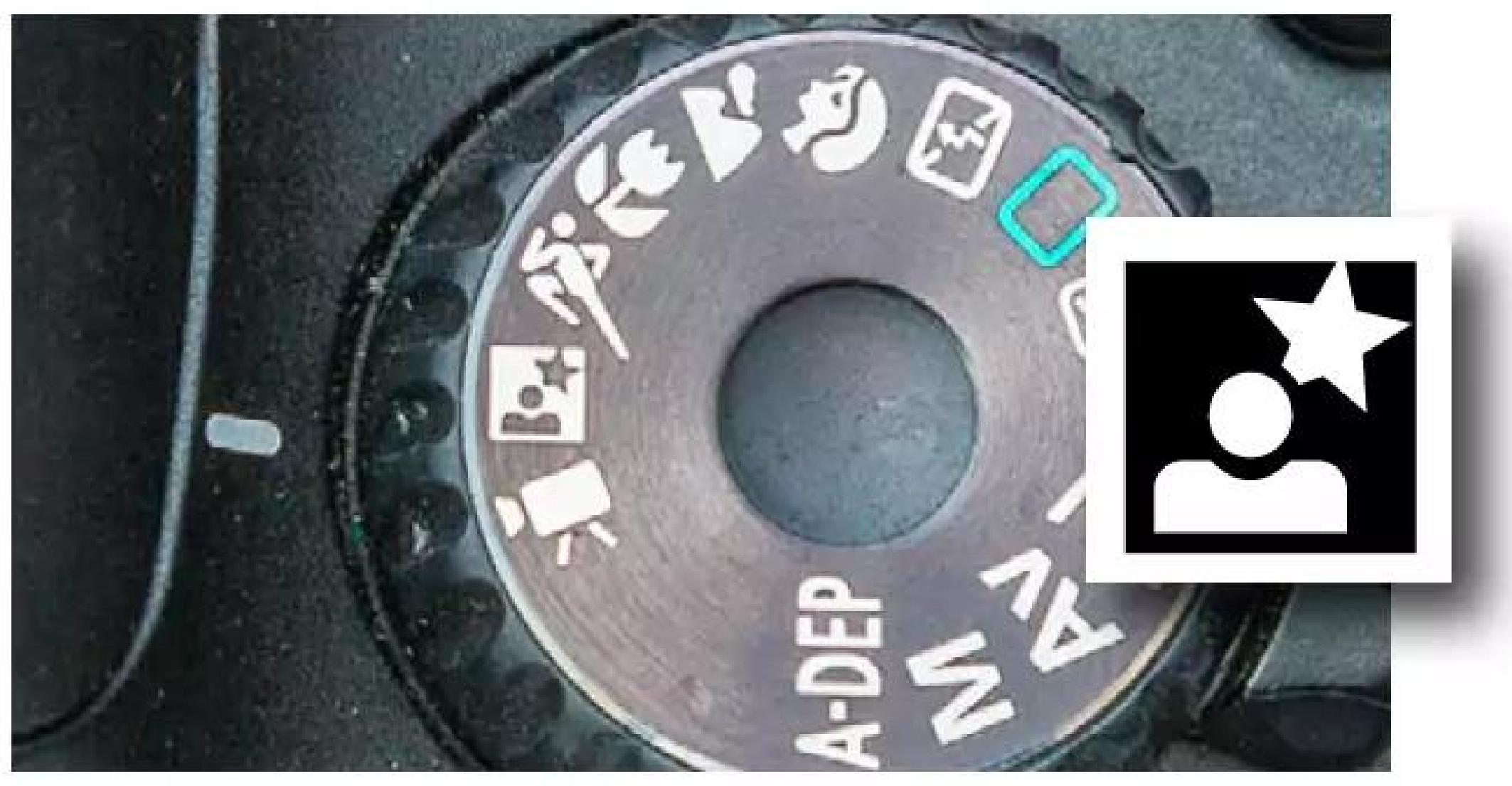
Close-up Mode (Macro Mode): Turning the Mode dial to the macro flower symbol sets the camera for capturing smaller subjects such as flowers, jewellery, and other small details. The autofocus mode is automatically adjusted to One Shot.



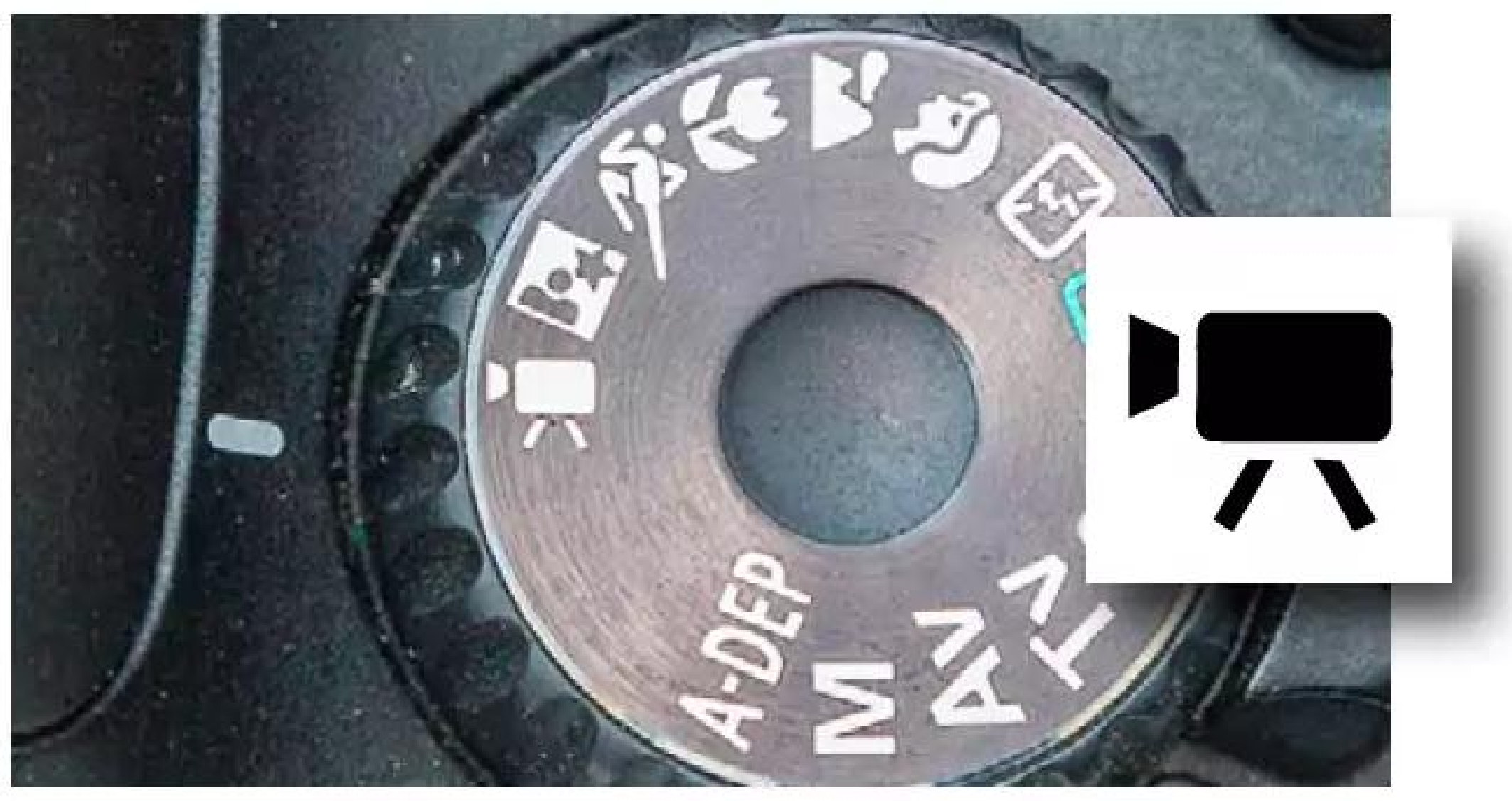
Sports Mode: This mode uses a faster shutter speed to capture fast-moving subjects. The autofocus mode is automatically set to AI Servo to predictively track your subject and keep it in focus as it moves.



Night Portrait Mode: This mode is for taking pictures of people at sunset or at night, letting the flash illuminate the subject, while the longer exposure provides a brighter view of the surroundings.



Movie Mode: When Movie mode is selected, the camera's mirror and shutter open, as in Live View mode, but the Live View / Movie button on the camera's back functions as the start/stop button for movie recording.



Focusing

Getting the best out of your autofocus system

“Autofocus technology has improved immensely, and these days even the most basic modern AF systems are generally fast, accurate and reliable.”

With only one or two exceptions, all current digital cameras have automatic focusing. The first autofocus systems were developed by Leica in the 1970s. The first autofocus compact camera, the Konica C35 AF, was introduced in 1977, and the first autofocus 35mm SLR, the Pentax ME-F, was launched in 1981. Since that time autofocus technology has improved immensely, and these days even the most basic modern AF systems are generally fast, accurate and reliable.

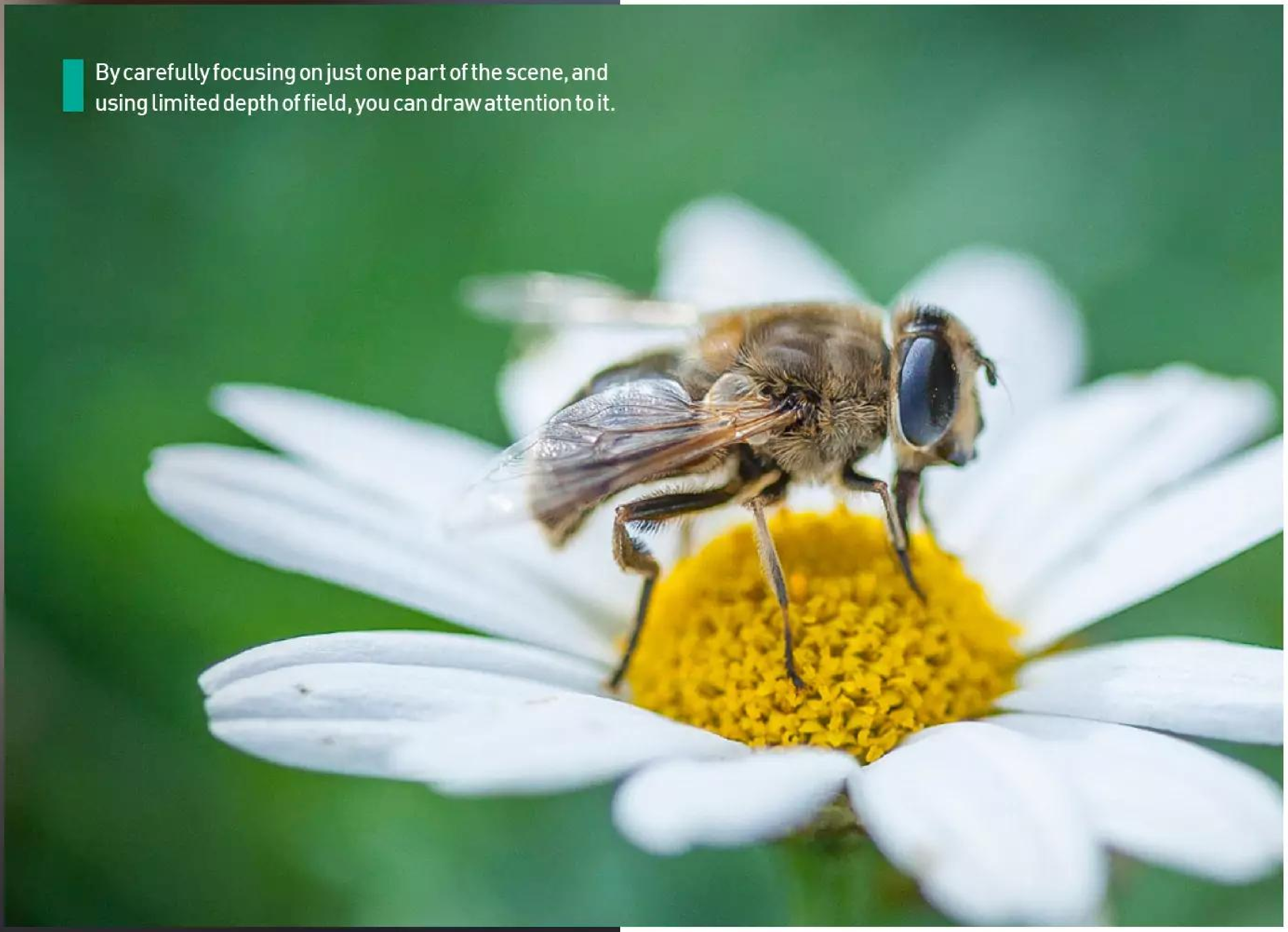
Although we now rely on autofocus for the vast majority of photographs, anyone who has tried taking a photo in low light, with fast-moving subjects or using very long telephoto lenses will have noticed that sometimes even the best AF system can run into problems. We’ve all stood there with the lens whirring in and out of focus, trying to get a lock on our subject, and eventually missed the shot. It’s very frustrating when this happens, but with a few simple tips you can help your camera to focus quickly and accurately even in difficult situations.

There are two main types of autofocus system in common use today. All compact cameras and most CSCs use something called contrast-detection AF, which samples the image from the main picture taking sensor and detects sharp high contrast edges in the details of the scene. Meanwhile all digital SLRs and Sony’s new SLT cameras use something called phase-detection AF, which uses an array of separate dedicated sensors usually mounted below and in front of the main imaging sensor. Phase detection is a more complex system, but it is usually much faster, more accurate and works better in low light. However both systems require some detail in the scene to 'lock on' to. Try it for yourself: point your camera at a plain wall or a sheet of white paper and see if it will focus on it. Even if you own a top-of-the-range DSLR it won't be able to focus on a featureless surface.

There are a couple of ways to help your camera to focus quickly on a scene. Most digital cameras have the option to select either single or continuous autofocus. Your camera will normally start to focus on the scene as soon as you half-press the shutter button. In continuous focus mode it will continue to update the focus if you then move the camera, but in single AF mode it will hold the same focus setting as long as you hold down the button, until you actually take the shot. You can use this to focus the camera on low detail targets by finding an object in the scene that's the same distance away as your chosen subject, focusing on that, and then holding the focus and reframing the shot. Similarly you can use it in reverse to focus on objects that aren't in the centre of the frame.

VC MODE/1
2
3
VC/ON
OFF
AF
MF
FULL
∞
10m
10m-2.2m

Different lenses have different minimum focusing distances, but many modern zoom telephoto lenses also have macro-focusing capabilities for close-ups.



By carefully focusing on just one part of the scene, and using limited depth of field, you can draw attention to it.

Moving targets

Compact camera AF systems are usually somewhat slower than those in DSLRs, which means they can have a real problem focusing on moving subjects. The way around this is either to use continuous AF or, if your camera has this option, to use manual focus. If you can tell where your subject is going to be, such as a car going round a tight corner on a race track or a child on a swing, you can pre-focus the camera on this point and wait to take the picture at the right moment. This method takes some practice and good reflexes, but it can produce excellent results.

Close-ups

All cameras and lenses have a minimum focusing distance, a closest point beyond which they cannot focus. For many compact cameras this distance can be very small, in some cases as little as 2cm (1in), but for standard DSLR lenses the distances tend to be longer. Most compact cameras have a 'macro' setting, usually denoted by the symbol of a flower. To get closer focusing with a DSLR or CSC, special close-focus macro lenses have to be used.

Depth of field is greatly reduced at very close focusing distances, and you may find that your AF system doesn't focus on the right part of the subject, for example if you are trying to photograph the centre of a flower, but the AF focuses on the petals, because they're closer. The best option is to use a tripod, and manually set the focus to the closest distance. Move the tripod until the front of the subject comes into focus, then carefully manually adjust the focus point to get the right part of the flower to look sharp. ■

Shutter speed

The shutter of your camera is simply a mechanical barrier

The shutter of your camera is simply a mechanical barrier that prevents light from entering the camera until it is needed, controlling when and for how long light is allowed in to expose the sensor. The latest digital cameras have high-speed electro-mechanical shutters capable of timing exposures with an accuracy measured in fractions of a millisecond.

Along with the aperture setting and the sensitivity control, shutter speed is one of the three ways that photographic exposure is adjusted. When a picture is taken, the shutter is opened for a precisely measured amount of time allowing light to pass through. The duration of the exposure is set either automatically by the camera's light meter or manually by the photographer. The wider the range of available shutter speeds, the greater the creative versatility of the camera.

Modern digital SLR cameras have a very wide range of shutter speeds available, usually ranging from 30 seconds to as high as 1/8,000th of a second, and most also have a 'B' setting, in which the shutter stays open for as long as the shutter release is held

down. The ‘B’ is from bulb. Very old cameras commonly used an air-bulb attachment as a remote shutter release.

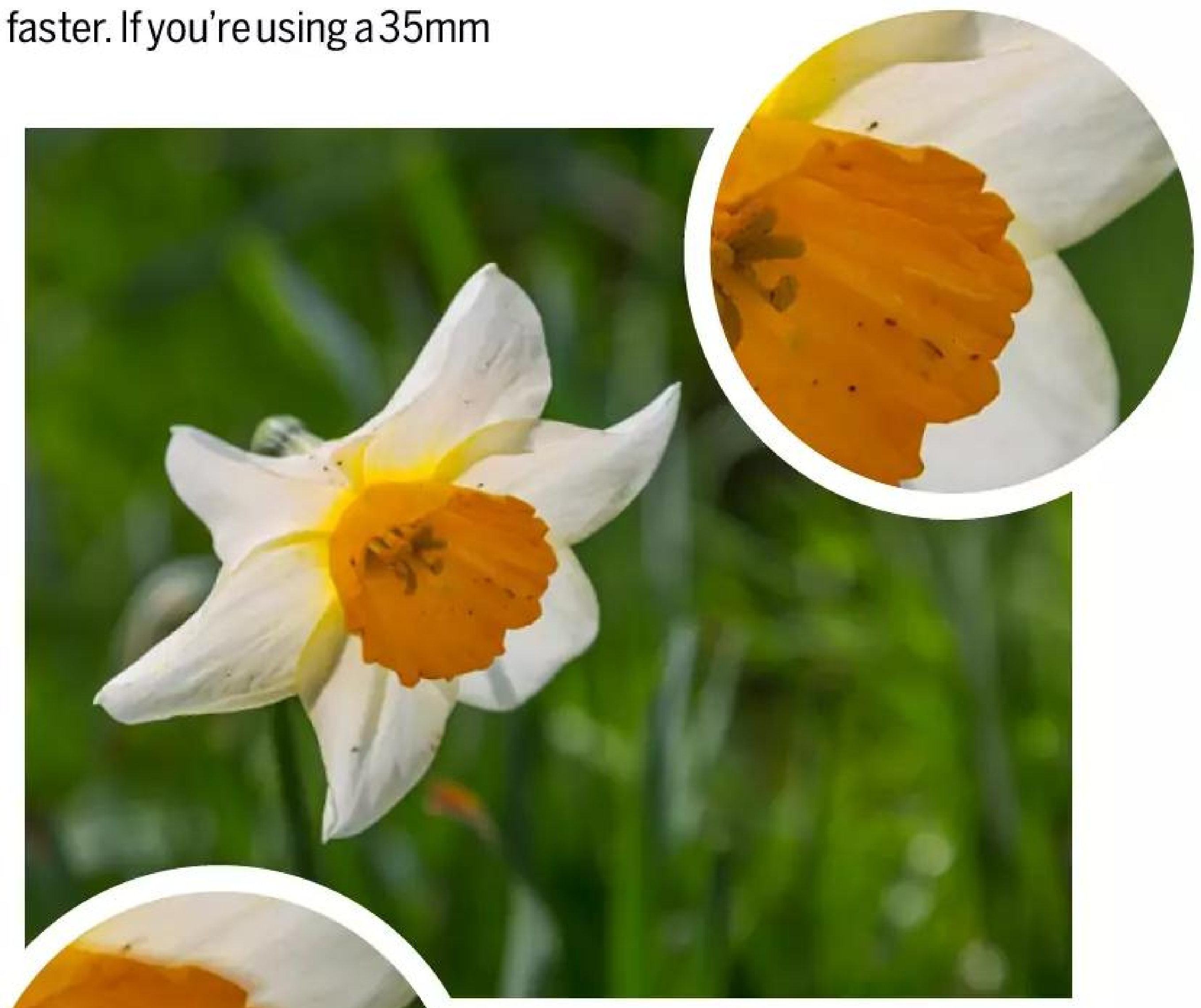
Shutter speed can be manually adjusted in either full manual exposure mode or in shutter priority mode, the latter usually denoted by an ‘S’ or ‘Tv’ on the exposure mode dial. Shutter priority is a semi-automatic exposure mode in which the photographer sets the desired shutter speed, and the camera’s exposure system adjusts the aperture accordingly to produce the correct exposure.

In automatic and program exposure modes the camera will set both the shutter speed and aperture automatically. Under normal daylight conditions, the shutter speed will usually be set to between 1/125th and 1/1000th of a second, since this is fast enough to freeze most movement and to reduce the effects of camera shake. However in low light conditions the camera may set a slower shutter speed, and with this comes an increased risk of movement blur caused by camera shake. Most cameras will display some sort of warning if this occurs. ■

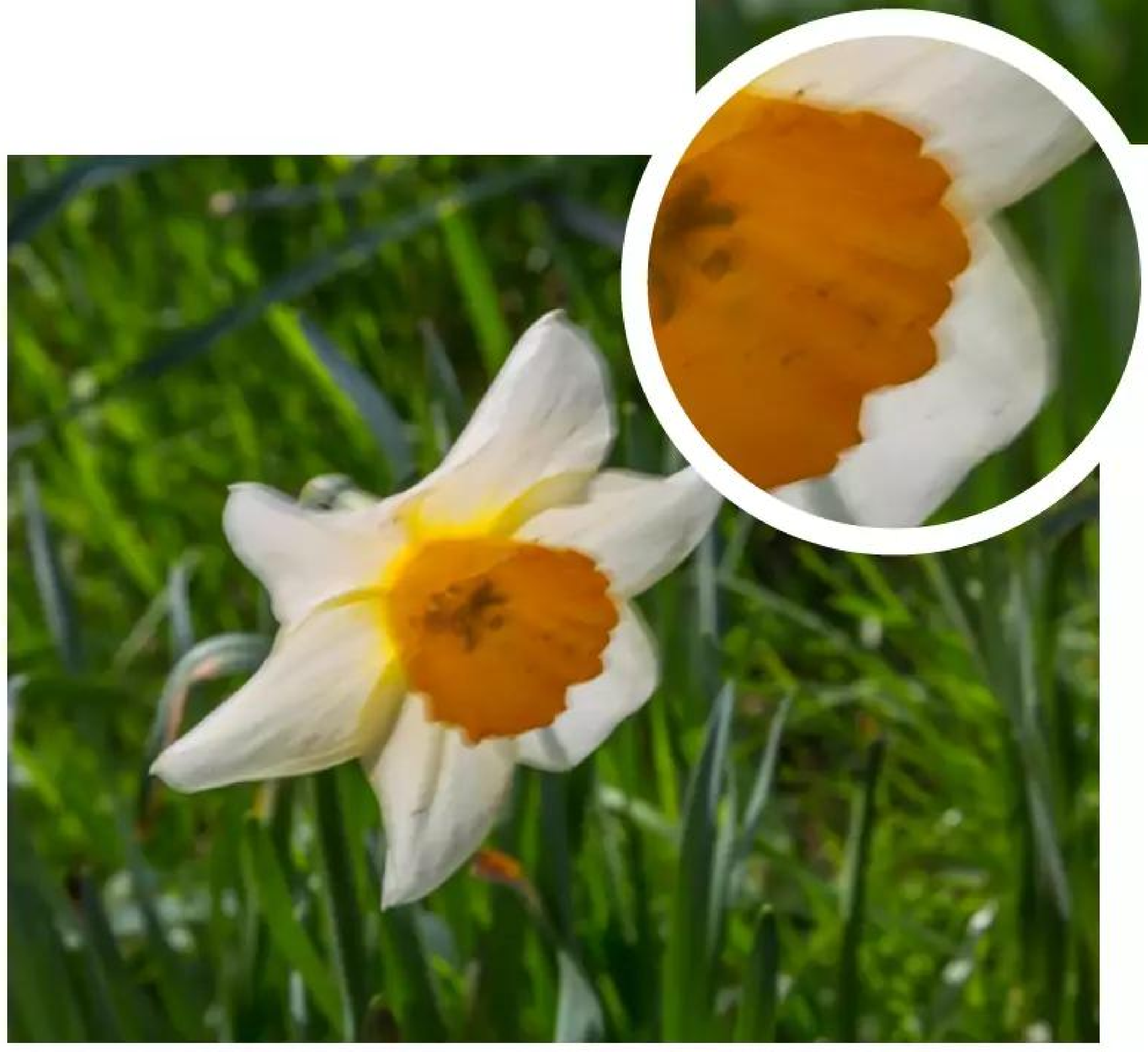
> “The wider the range of available shutter speeds, the greater the creative versatility of the camera.”

AVOIDING CAMERA SHAKE

When shooting hand-held and wishing to avoid camera shake, as a rule of thumb you can safely use a shutter speed roughly equivalent to the reciprocal of the focal length you are using. For example if you’re using a 100mm focal length then you can take a sharp hand-held shot at a shutter speed of 1/100th of a second or faster. If you’re using a 35mm focal length then 1/35th of a second is safe, and so on.



Here’s an example shot taken hand-held at a focal length of 100mm and a shutter speed of 1/100th of a second. As you can see it’s sharp and shake free.

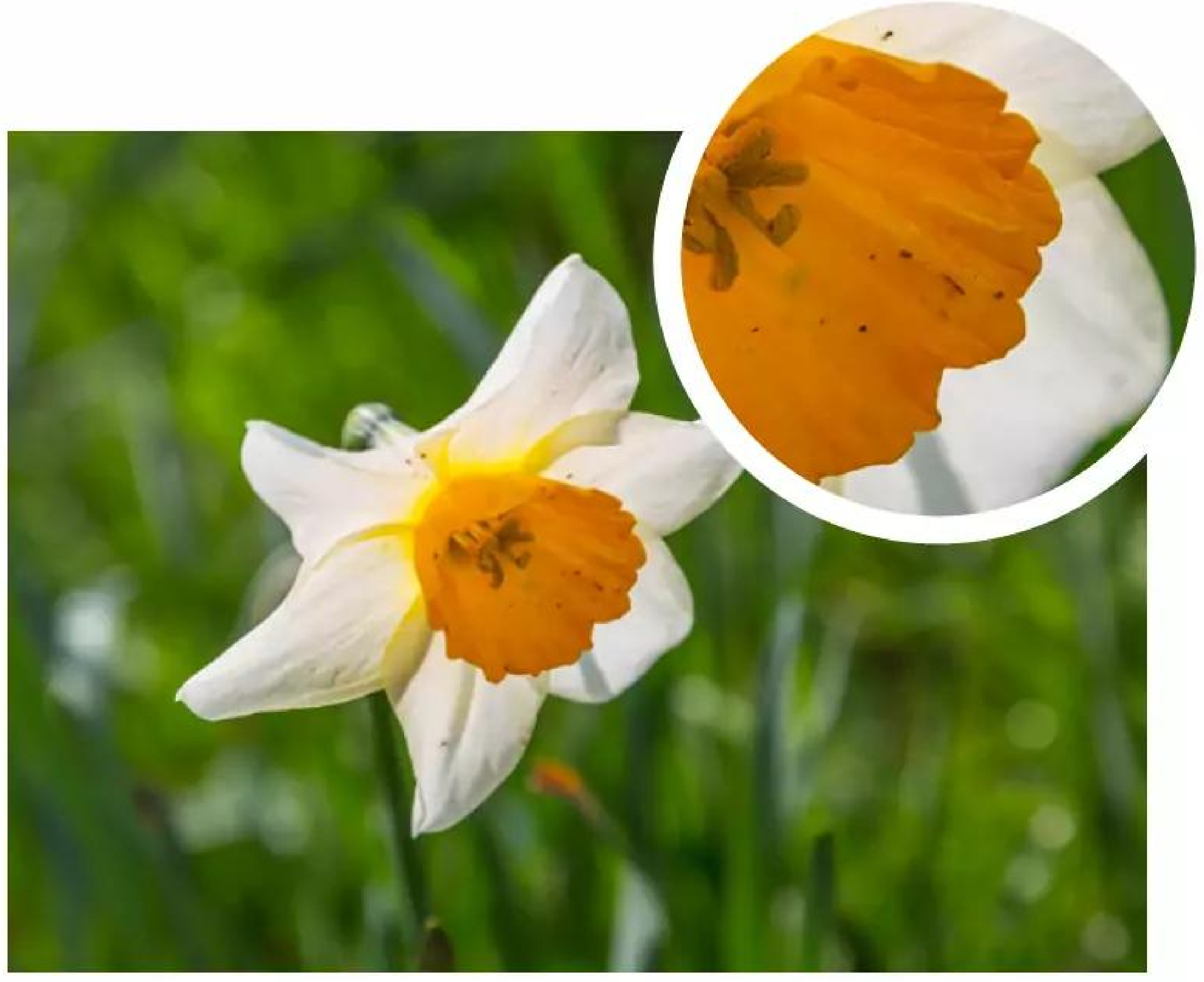


Here’s the same hand-held shot but this time with a shutter speed of 1/10th of a second. At this speed and focal length it’s much more difficult to hold the camera steady. As you can see, the result is quite blurred.

Many modern cameras include technology which can reduce the effects of camera shake at low shutter speeds. Many compact cameras use electronic processing to counteract movement, which does work but produces relatively poor image quality. Among digital SLR and CSC manufacturers there are two types of image stabilisation in common use. Canon, Nikon and Panasonic favour optical stabilisation, where elements within the camera lens are moved to counteract camera shake. Other brands including Pentax and Sony employ a system which moves the camera’s sensor to achieve the same effect.

There is no clear advantage between moving-lens and moving-sensor systems. Modern image stabilisation systems of both types can provide around three or four stops of additional stability, however the sensor-shift method has an advantage for SLR users because the non-stabilised lenses are usually considerably lighter and are often also cheaper to buy, since the complex anti-shake system is built into the camera body. It also means that photographers using older pre-digital lenses can still have the advantage of image stabilisation.

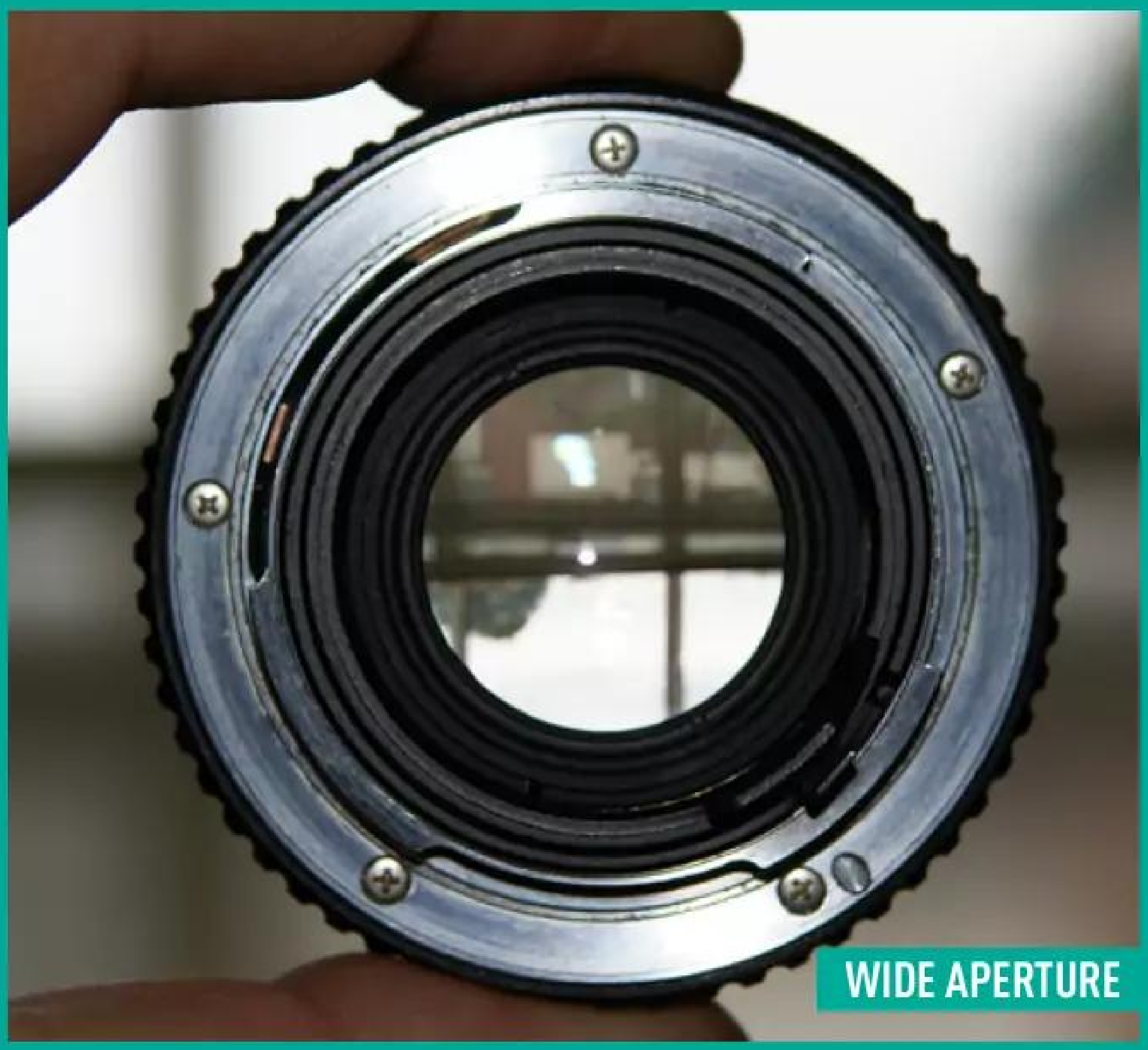
This example shot was taken with a focal length of 100mm at 1/10th of a second as before, but this time the image stabilisation (in this case a sensor-shift system) is switched on. It has detected the vibration and corrected it by moving the sensor to compensate, resulting in a much sharper shot.

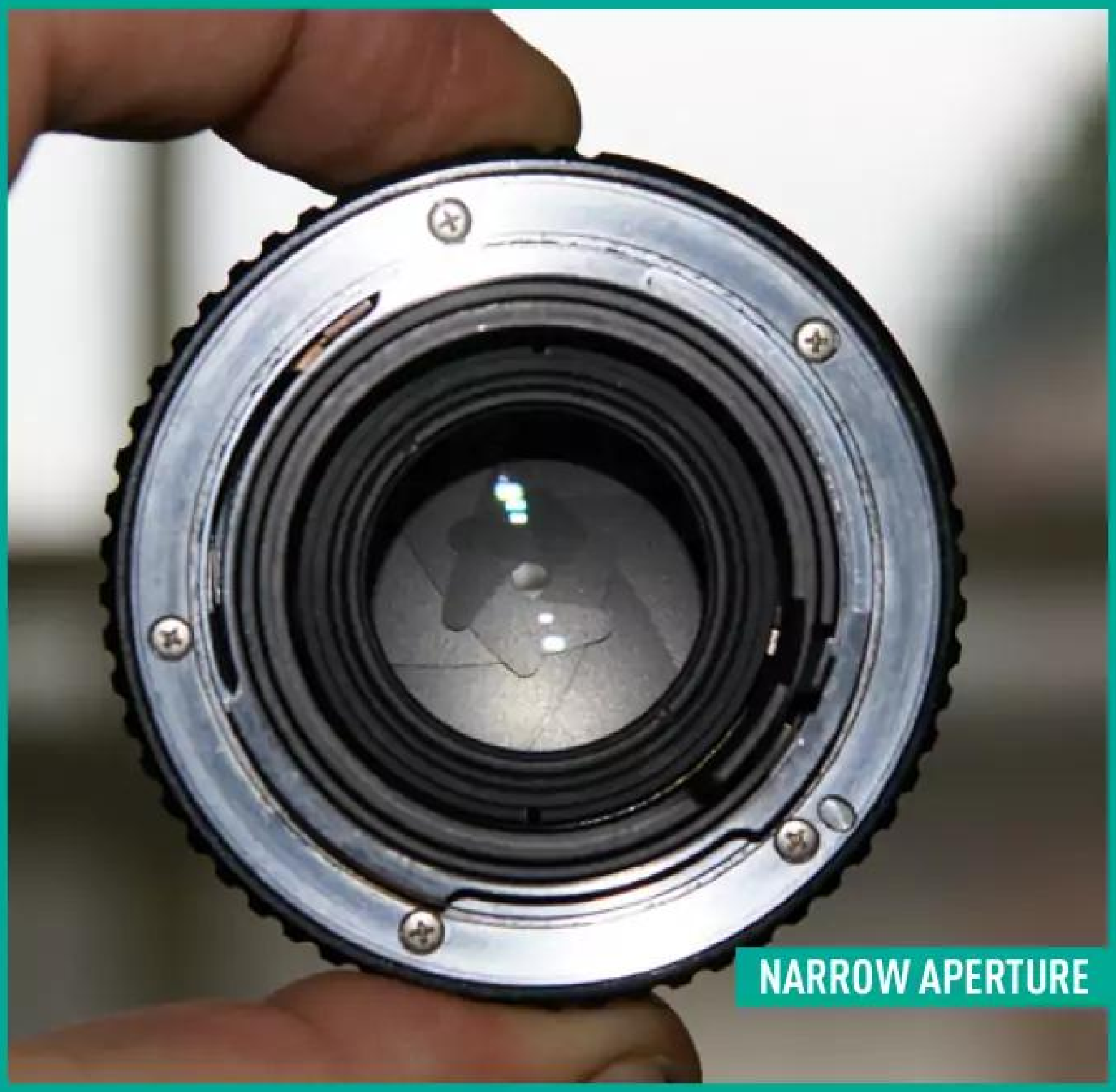


Using a very wide aperture and precise focusing, emphasis can be given to one subject to effectively isolate it from its surroundings.

Aperture and depth of field

With aperture you can control how much of your picture is in focus





Of the three main controls common to nearly all cameras, shutter speed, focus and aperture, it is aperture adjustment that is the least well understood. This is because it not only helps to control exposure, but also affects something called Depth of Field. Understanding the effects of aperture size is a vital skill for any keen photographer.

At least there's nothing mysterious about the name. The aperture is literally a hole through which light passes after it enters the lens. The diameter of this hole can be altered, allowing a greater or smaller amount of light to pass through on its way to the sensor. In the early days of photography, aperture was adjusted by slotting cards with different sized holes cut in them into the body of the camera behind the lens. These cards were known as 'stops', and this is still part of photographic terminology today. On modern cameras the aperture is controlled by an arrangement of curved shutters inside the body of the lens, which move to produce a continuously variable aperture, however the aperture settings are usually still referred to as 'F-stops'.

Aperture adjustment is used in combination with the shutter speed and ISO sensitivity to control photographic exposure. However it is also the primary means of controlling something called depth of field, a concept that may need a bit of explanation.

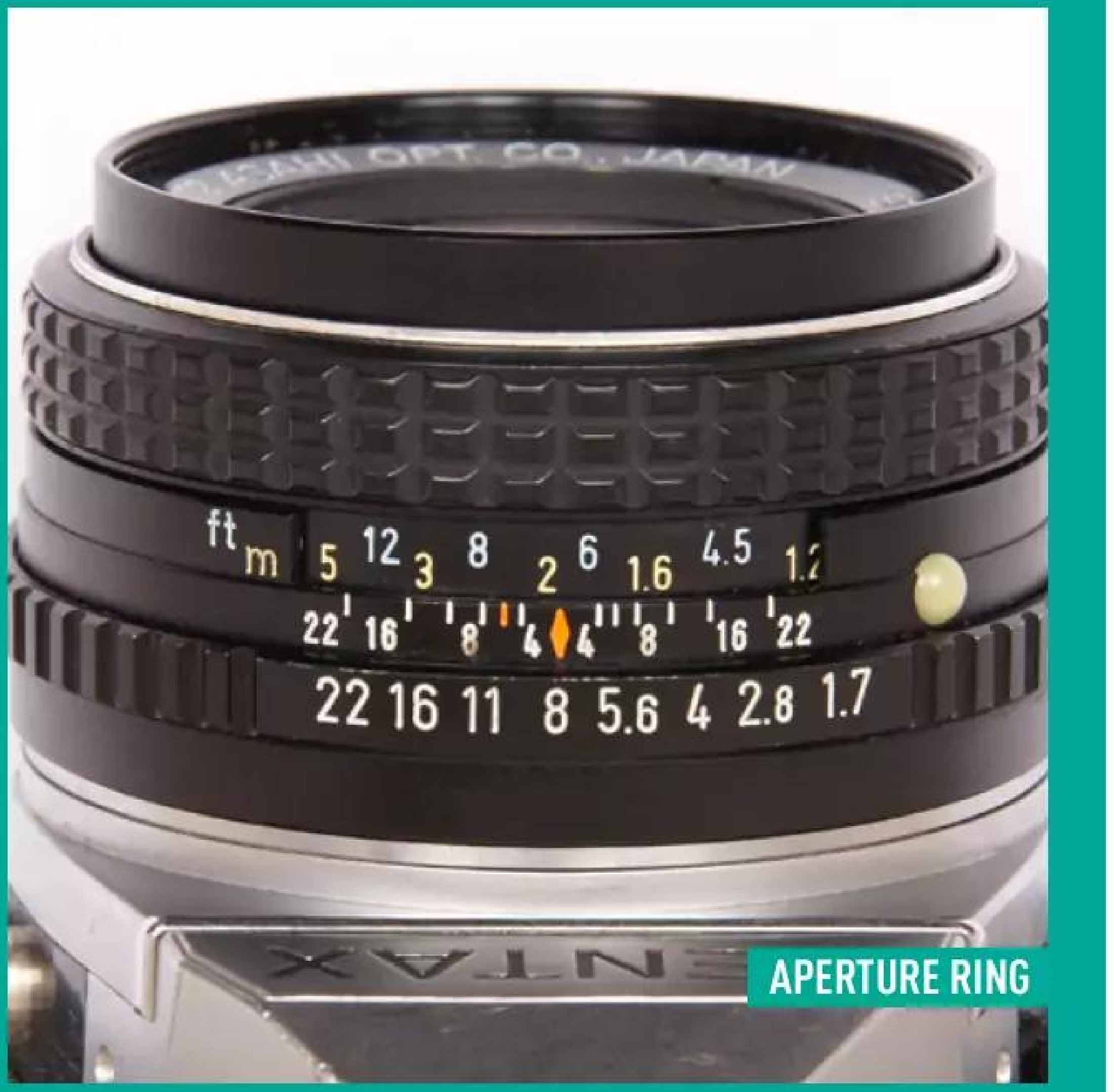
If you take a photo of a subject at a distance of about 3 metres with standard zoom lens, in good light with the focal length set to about 30mm, as

> "Understanding the effects of aperture size is a vital skill for any keen photographer."

long as the lens is focused correctly the subject should appear nice and sharp in the image. However you'll usually find that objects about 1.5m in front of the subject, and for about 4 or 5 metres behind the subject, also appear sharp. This distance, from the closest point of acceptable sharpness to the most distant, is known as the depth of field.

By altering the size of the aperture it is possible to control the extent of this depth of field, either reducing it so that only the main subject is in sharp focus, or expanding it so that an entire landscape can appear to be just as sharp.

If you have an older camera to hand, take a look at the lens. It will have a ring for controlling the aperture setting, labelled with numbers usually from about F2 to about F22. The focus control ring will have distances usually calibrated in feet and metres, and alongside it you'll usually find lines marked with the same numbers as the aperture ring, arranged in pairs either side of the focal distance mark with the larger numbers toward the outside. The purpose of this aperture scale is to help estimate the depth of field at a particular distance for any given aperture setting; with the focus set to a particular distance, anything between the two lines for the selected aperture setting should be acceptably sharp. Some older zoom lenses have a series of curved lines etched into the lens barrel for the same purpose. For some reason this scale is missing from most modern auto-focus, auto-aperture lenses, which is a shame because it makes the whole concept of depth of field much easier to understand. ■

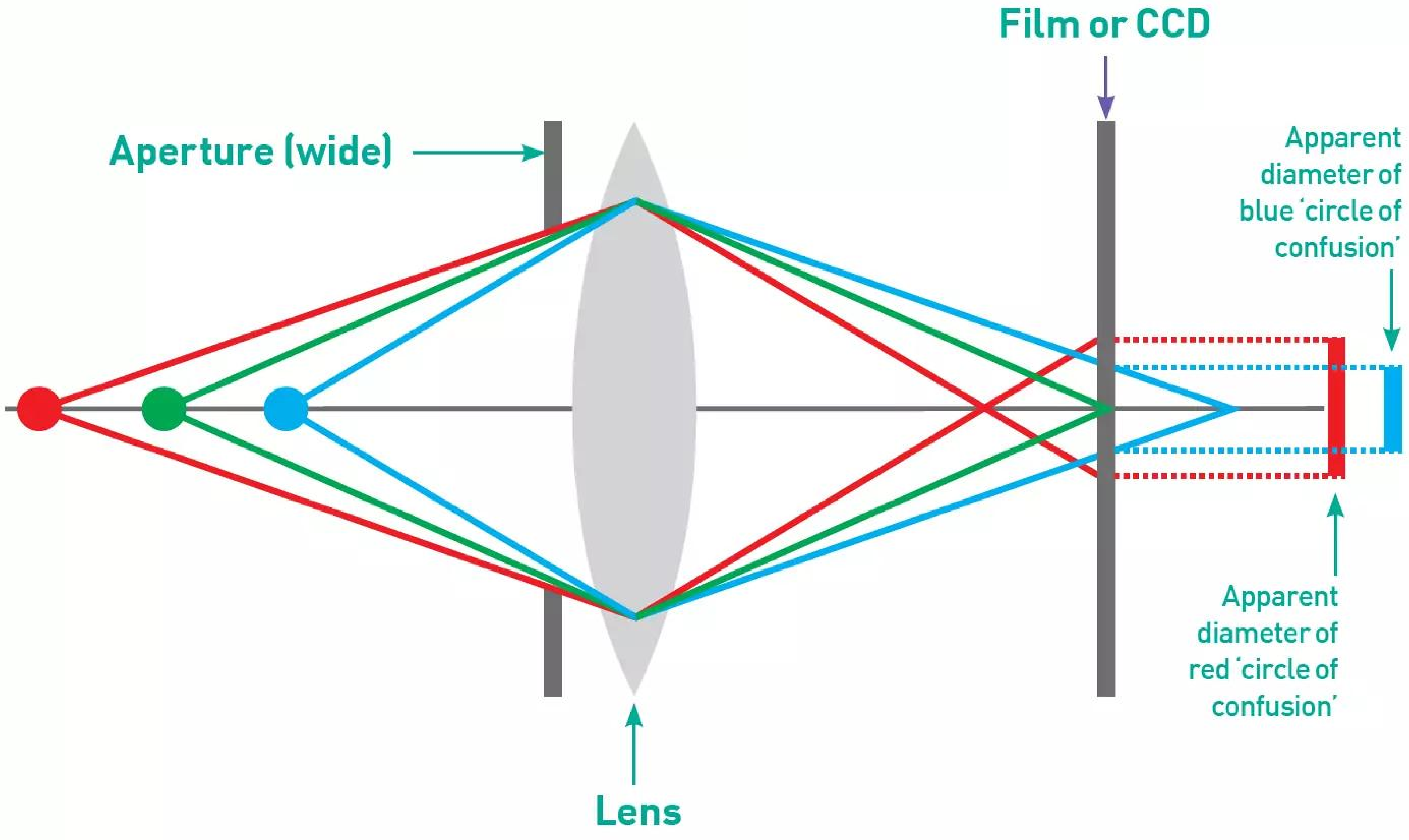


APERTURE RING

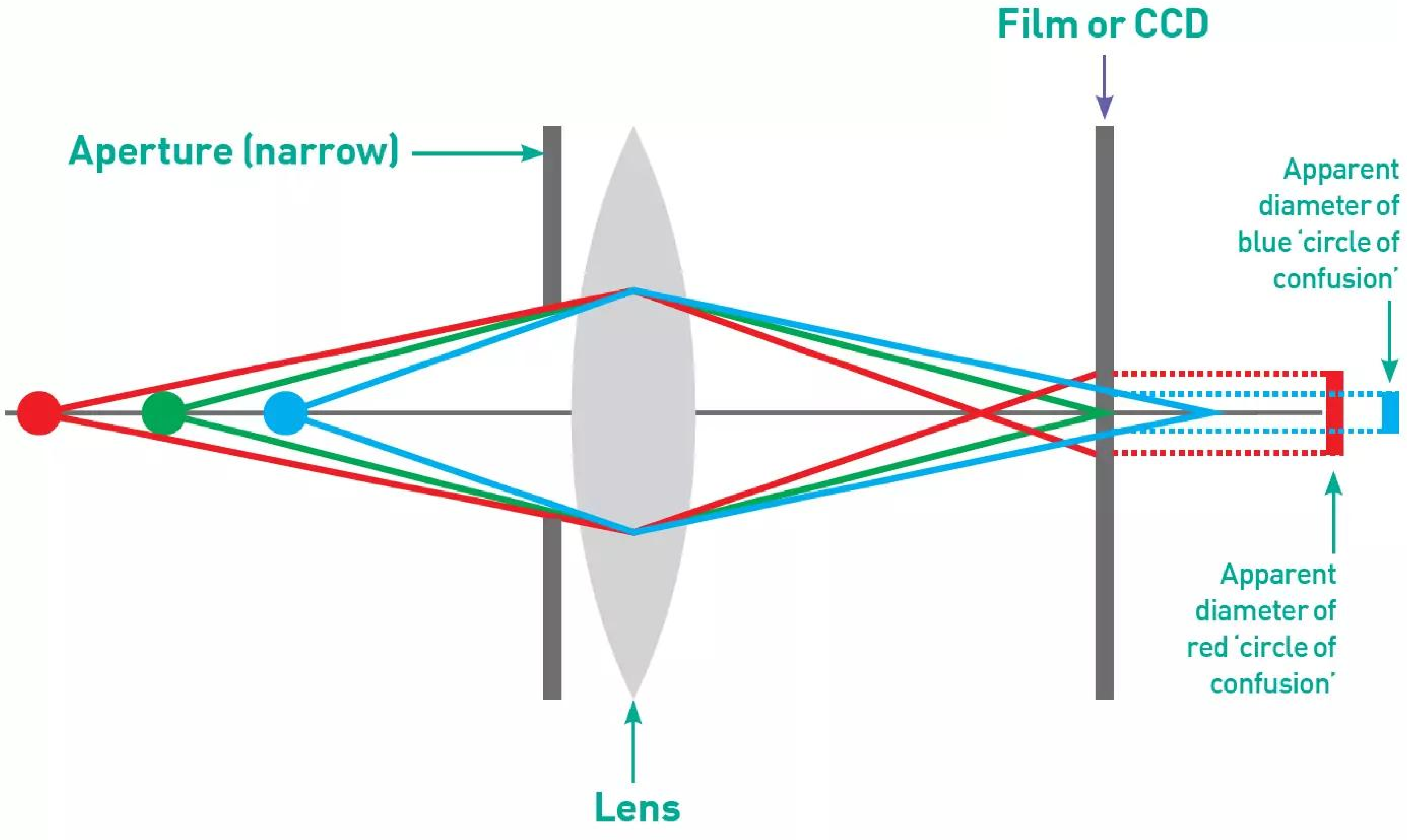
Explaining exactly why altering the size of the lens aperture alters the depth of field is a little complicated, but a few simple diagrams should help to shed some light on the matter. For a start, let's clear up some popular misconceptions about the difference between focus and sharpness.

This is a highly simplified diagram of the arrangement of lens, aperture and sensor inside a modern digital camera. In this first diagram, three subjects at different distances from the camera lens are represented by the red, green and blue dots. The lens is focused on the green spot, so light from it passes through the aperture and the lens and appears sharply focused on the sensor. Light from the red and blue spots also passes through the aperture and lens, but light from the red spot focuses a short distance in front of the charged coupled device (CCD), while light from the blue spot focuses a short distance behind it. The light from these other spots still hits the CCD, but due to light scattering it is unfocused and spread over a wide area.

What this means is that the red and blue spots will appear as large blurred spots on the final image, while the green spot will be sharp and in focus. The size of the blurred area of the red and blue spots is called the 'circle of confusion.'


Film or CCD
Aperture (wide)
Apparent diameter of blue 'circle of confusion'
Apparent diameter of red 'circle of confusion'
Lens

The diagram below shows the same arrangement of camera and subjects, and the coloured spots are the same distance from the lens, but this time the aperture has been reduced to just a small hole. Again the lens is focused on the green spot, and the red and blue spots are out of focus. However the narrow aperture restricts the light scattering and the relative angles of the light paths, and as a result the 'circles of confusion' are much smaller. This makes the red and blue spots in the final image appear much sharper. They are still out of focus, but the effect is not so noticeable. To make circles of confusion as large as in the first image, the red and blue spots would have to be much further away from the green one.


Film or CCD
Aperture (narrow)
Apparent diameter of blue 'circle of confusion'
Apparent diameter of red 'circle of confusion'
Lens

Focal length and zoom

Understanding how focal length works in composing shots

Nearly all modern compact cameras have zoom lenses, and most users of digital SLRs or CSCs will also have at least a couple of zooms in their kit. Focal length is one of your primary tools for adjusting composition. Selecting the right focal length for the scene allows the photographer to control perspective, angle of view and magnification, and can radically alter the mood and style of the photo. Some focal lengths are more suited to particular types of photo, and the properties of wide-angle and telephoto lenses can be used to produce particular effects. Understanding how focal length works and how it affects your photos is a vital photographic skill. ■

Lenses and focal length

There are two types of lens: those with fixed focal lengths, also known as prime lenses, and those with variable focal length, or zoom lenses. They both have their own advantages and disadvantages. Prime lenses are usually smaller and lighter than zooms, and also generally have much faster maximum apertures than a zoom lens at equivalent focal length. The optical quality of prime lenses is also usually a little higher than the equivalent zoom lens. Zoom lenses however are much more convenient, allowing the photographer to cover a wide range of focal lengths with just one or two lenses, rather than carrying around a bulky collection of prime lenses. There are some fast zoom lenses, but they tend to be extremely expensive.

The focal length of a lens is an expression of its magnifying power, and is usually stated in millimetres. If you look on the front of your camera, usually inscribed around the front of the lens you'll find the focal length, or a range of values for zoom lenses. For a typical DSLR kit lens this will usually be around 18-55mm. For digital cameras it is fairly usual to see two figures quoted, both the actual focal length and the 'equivalent' length. The reason for quoting both is simply that more people are more familiar with the sizes of 35mm lenses, so they know that 28mm is wide angle and suitable for panoramic shots, or that 200mm is a telephoto, suitable for long-range subjects.

Real and equivalent focal lengths are different because most digital camera sensors are a lot smaller than a frame of 35mm film, and are fitted much closer to the lens than the film would be. Most consumer DSLRs use the APS-C sensor format. Exact sizes vary from one manufacturer to the next, but are typically around 22.5 x 15 mm. A frame of 35mm film measures 36 x 24mm, which means that the edges are 1.6x longer, so the focal length of the lens would need to be 1.6x greater to produce the same image size and magnification. This is usually referred to as the 'conversion factor' or 'crop factor'. It means that a typical 18-55mm DSLR zoom lens is roughly equivalent to the popular 28-80mm zoom lens often used on full-frame 35mm systems.

Compact camera sensors are even smaller still. Because there are several different sizes of sensor in common use it is more usual for compact camera zoom lenses to be rated in terms of their magnification power, such as 3x, 4x, 10x etc. This relates to the difference between the minimum and maximum focal lengths. A lens with a range of focal length from 5.8mm to 17.4mm is called a 3x zoom, because 17.4 = 3 x 5.8.

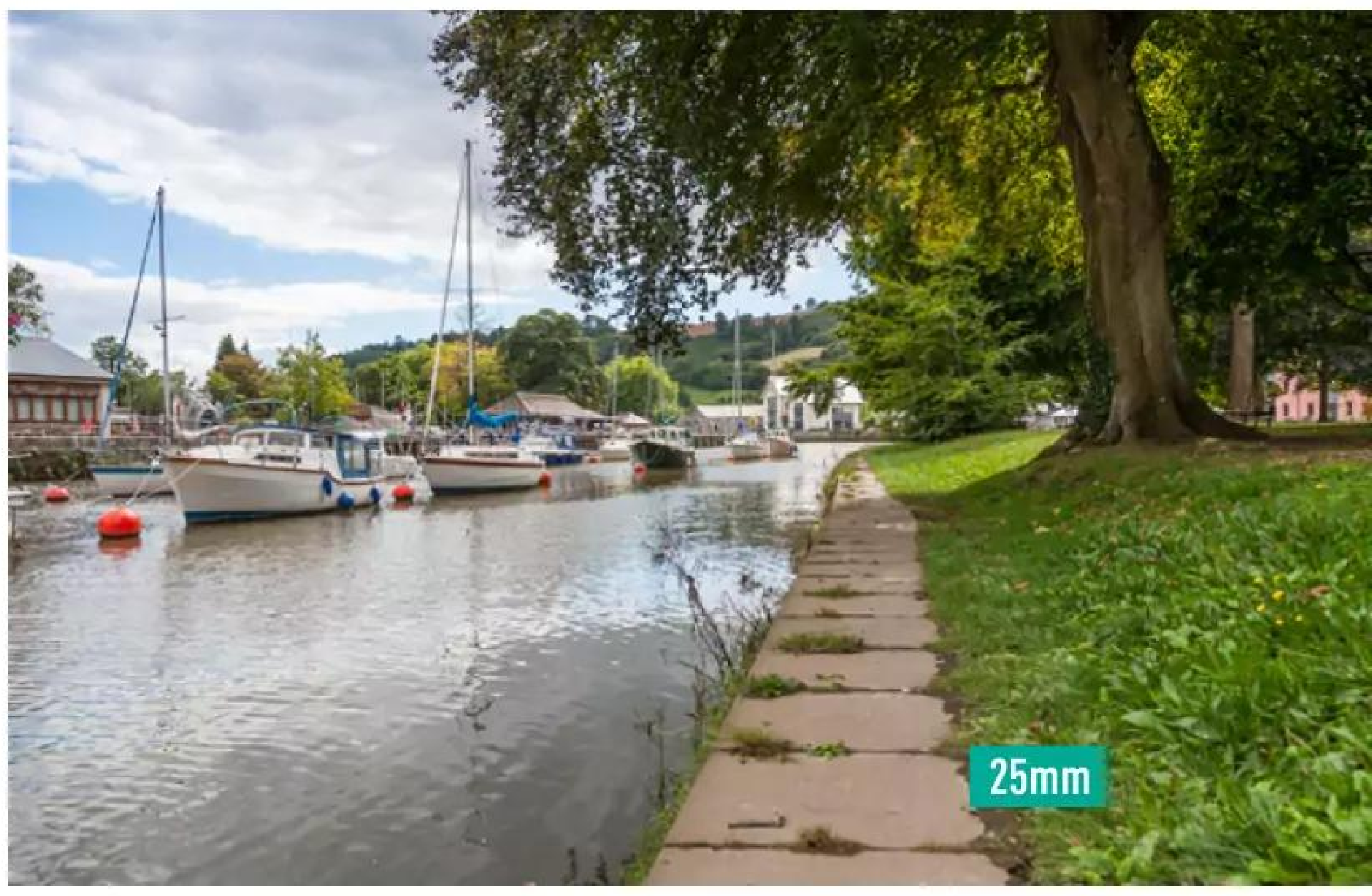
While in older prime lenses a 200mm lens would literally be 20cm long, modern optical systems use multiple lens elements working in combination, which means that the light path can be shortened while still maintaining the same effective magnification. As a result quite powerful telephoto and zoom lenses can be relatively compact.

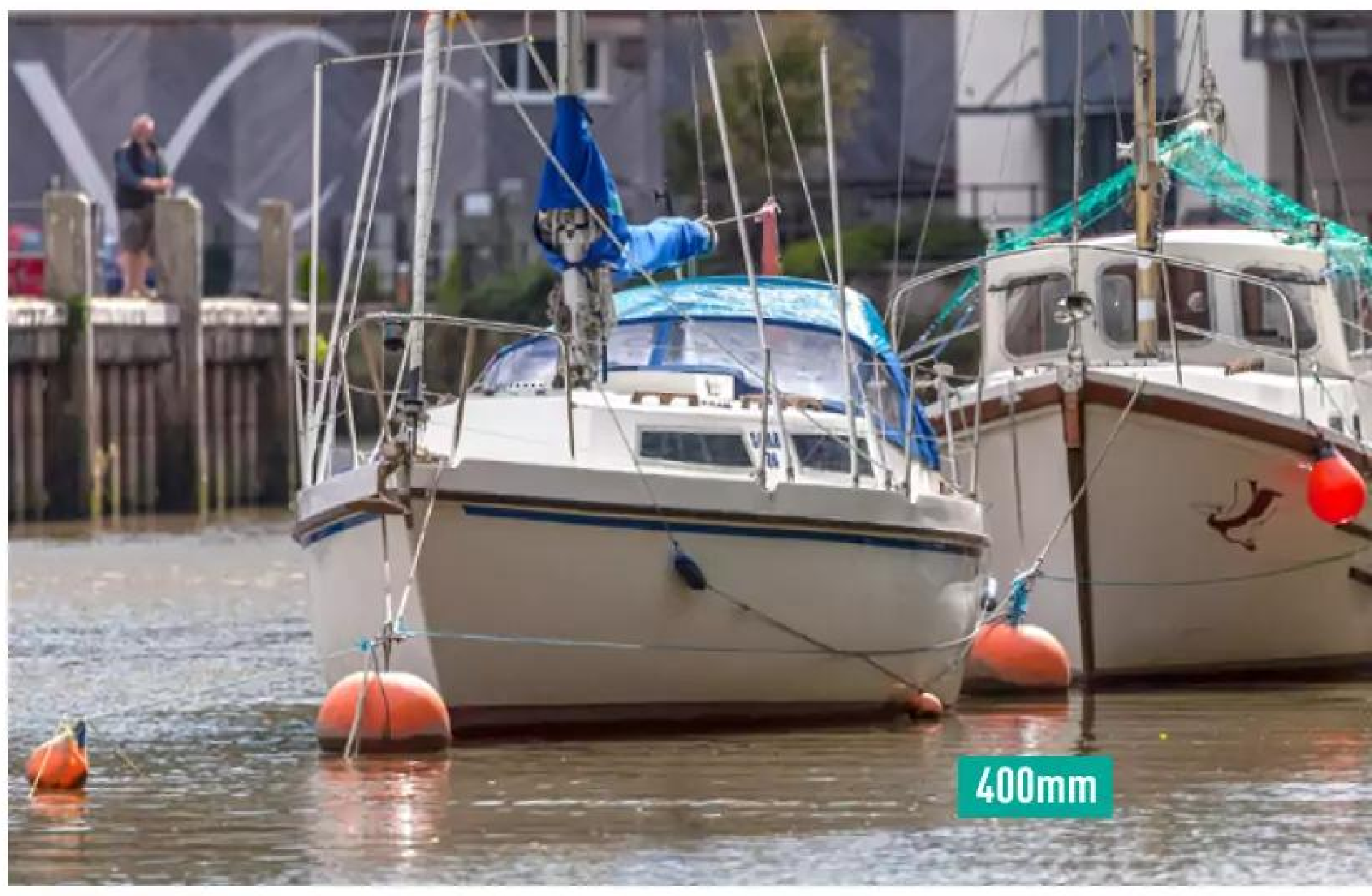
Wide-angle and telephoto are relative terms. On a 35mm film SLR a 50mm lens produces approximately the same perspective and magnification as the human eye, and has traditionally been the standard lens for this type of camera. Anything longer than 50mm is considered a telephoto, while anything shorter is considered wide angle. Digital SLRs tend to follow this rule too, although considering the crop factor the mid-point is about 35mm. ■

The shots seen in this set of examples were taken with the 24-105mm f/4 L (above) and the 100-400mm f/4-f/5.6 L zoom lenses.

Magnification

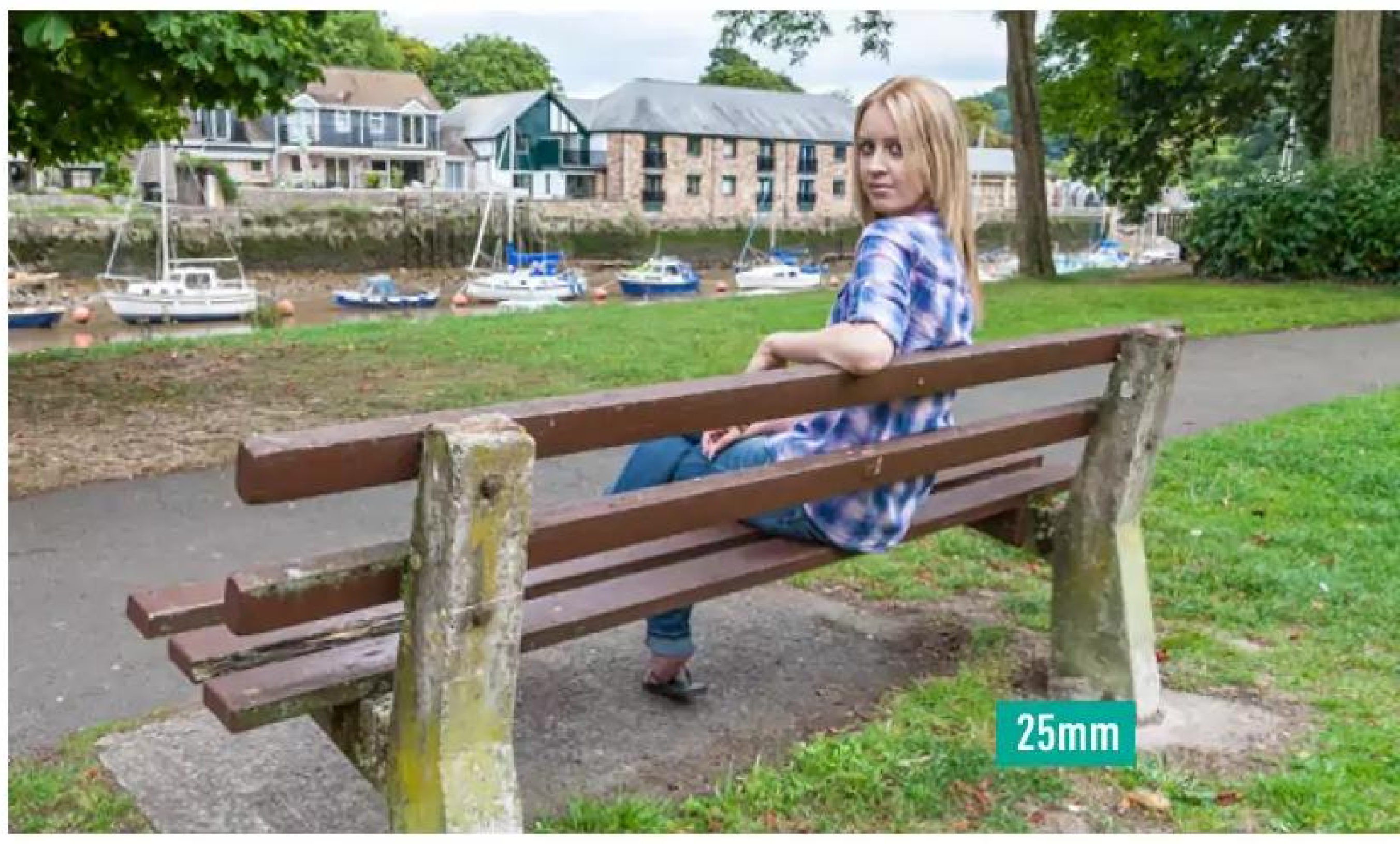
The most obvious effect of altering focal length is the change in magnification. Anyone who has ever used a zoom lens will be familiar with this effect. If you want to take a photo of something a long way away, you zoom in and the subject appears closer.

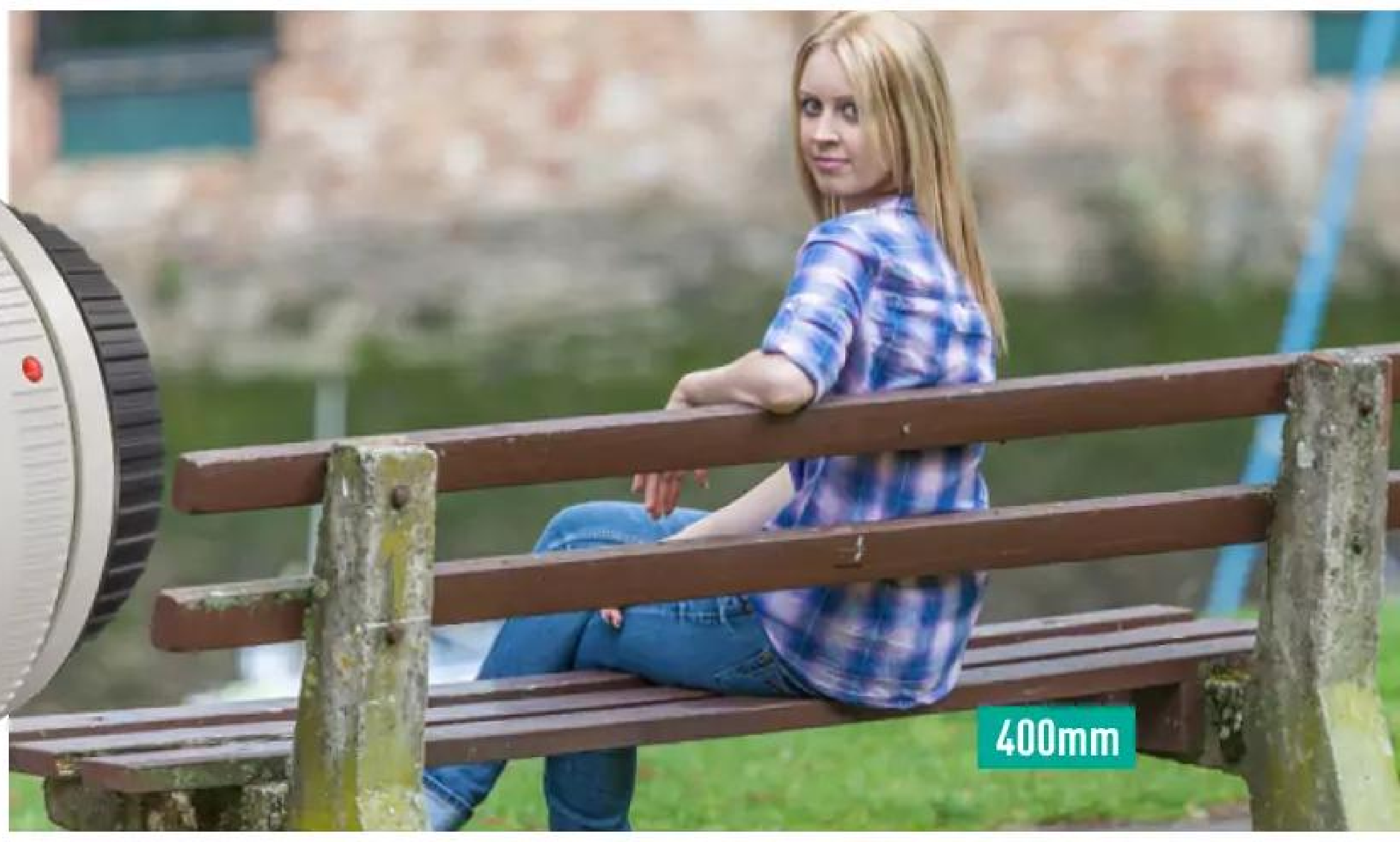


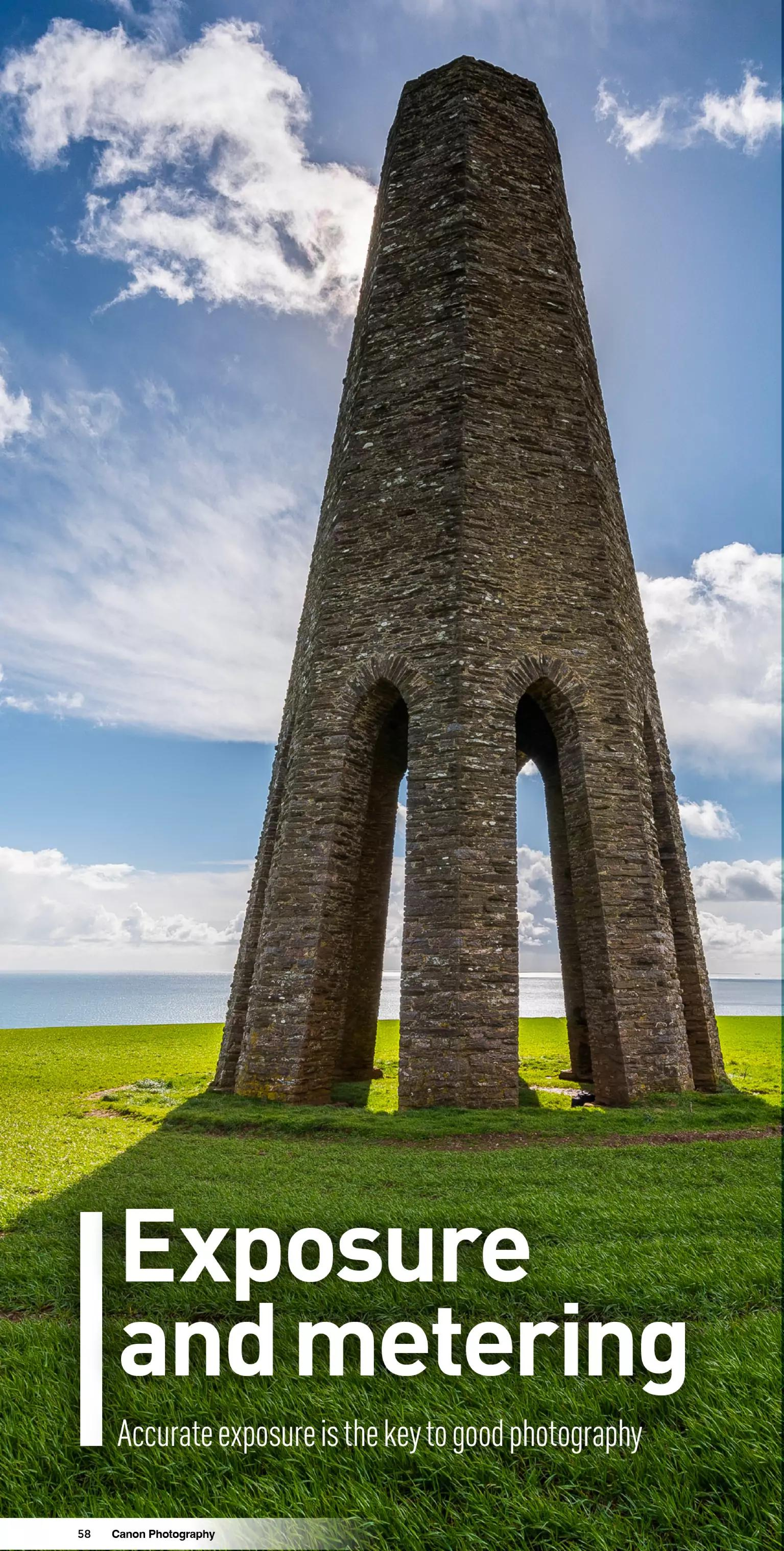


Angle of view

Changing the angle of view can be used to produce some interesting effects. If we move closer to the subject while shortening the focal length we can see that although the subject fills roughly the same area of the final image, in a wide angle shot a lot more of the background is included.







Exposure and metering

Accurate exposure is the key to good photography

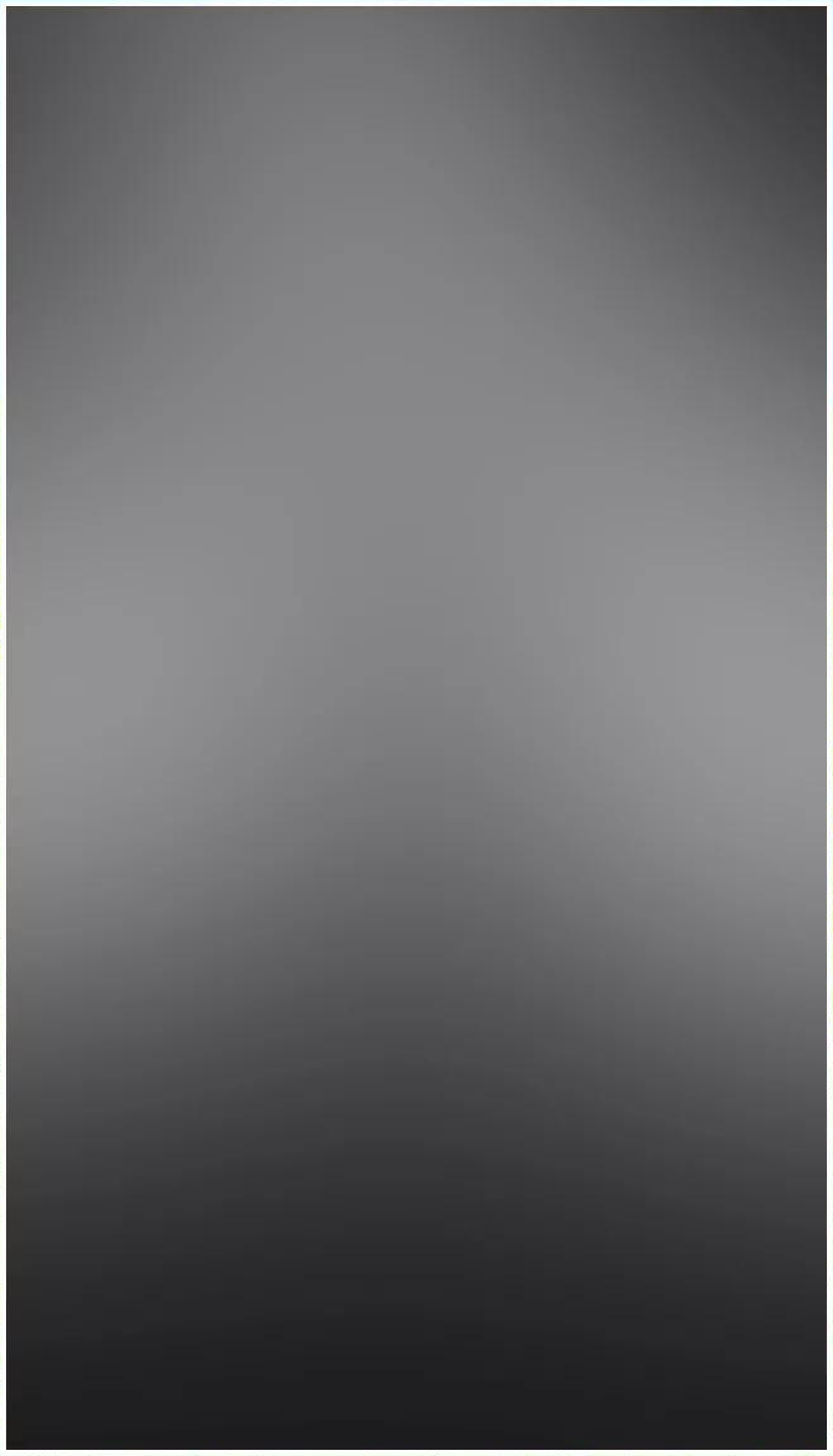
Understanding exposure and how it affects your photographs is probably the single most important technical skill you can learn in photography. It's certainly the one that most people get wrong, and apart from camera shake bad exposure probably ruins more photos than any other single cause. The main problem is over reliance on the use of automatic metering.

Most modern cameras, even relatively cheap compacts, have sophisticated built-in TTL multi-zone evaluative exposure meters that measure light levels at dozens, in some cases hundreds, of points within the frame, instantly comparing the results with a built-in library of exposure situations and automatically adjusting the shutter speed and aperture to deal with problems such as back-lighting, close-ups or moving subjects.

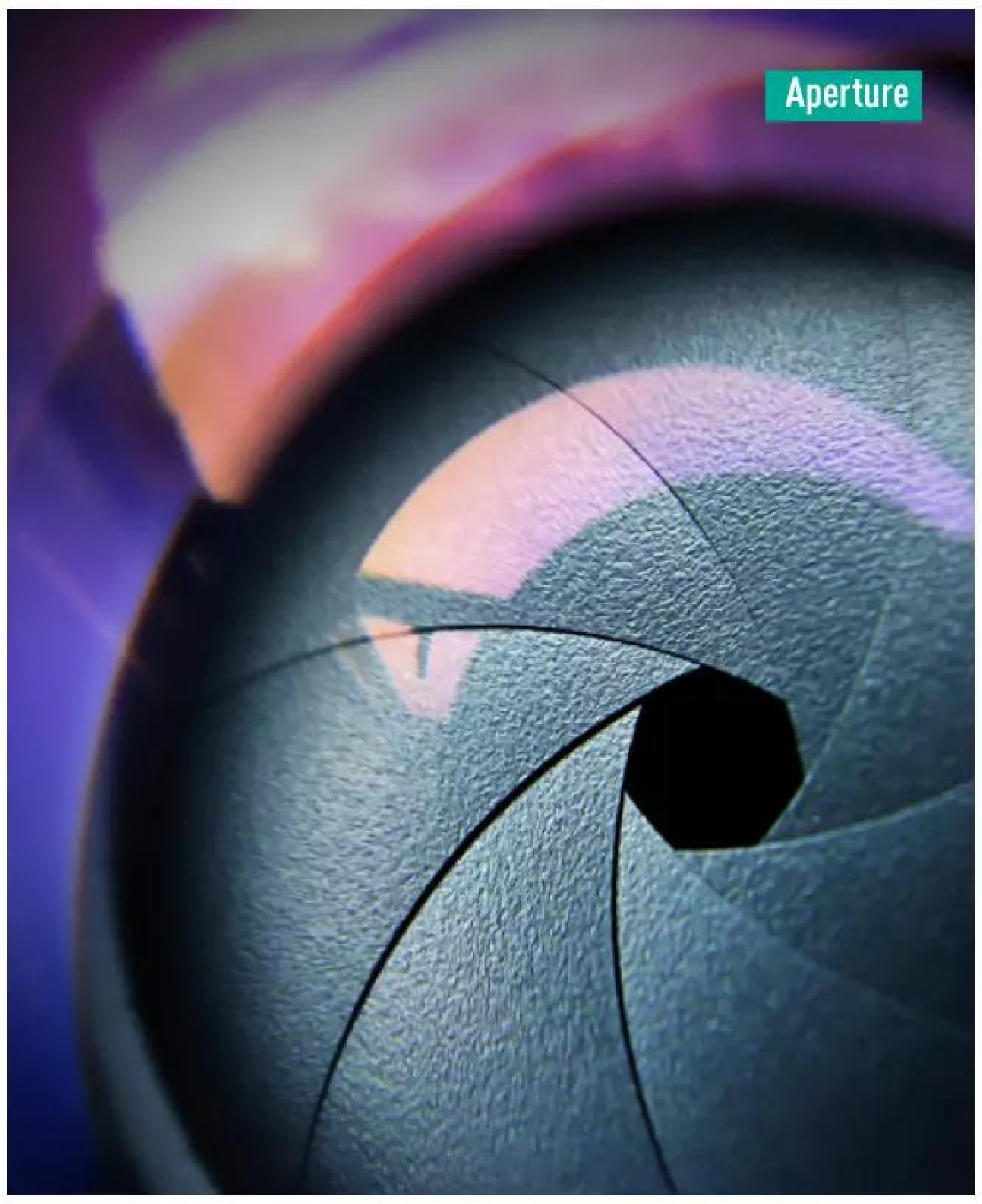
In most cases these automatic exposure systems are very good, and can reliably cope with most common circumstances. However even the best automatic meter can be fooled, resulting in poorly exposed photos. By overriding the camera's automatic settings and adjusting exposure manually we can avoid these problems and take much better photos.

Fade to grey

Take a look at this picture. What you see here is a nice scene with a good tonal range, plenty of colour, and some nice crisp sunlight. What your camera's light meter sees is this:



The photographer's trinity. Aperture, ISO and shutter speed. One always has an effect on the others. A basic principle, but an important one.



Shutter speed

Try it out for yourself. Find any nice, average snapshot scene, properly lit and with good contrast. Start up your image editing software and open your picture. Light meters only see in black and white, so reduce the saturation of the shot to zero. Your light meter doesn't see detail, so set your Gaussian blur filter to maximum diameter and apply it a couple of times. Use the eyedropper tool to measure the RGB colour value of the resulting tone. You should find that it averages out to a mid-tone grey with an RGB value of around 127,127,127.

It's an interesting and curious fact that any average scene reflects 18% of the light falling on it. Look out of your window, and unless you live in Antarctica the scene you see is reflecting exactly the same amount of light as the scene out of my window. That 18% reflection is exactly the same as a mid-tone grey, mid-way between black and white.

Light meters are calibrated with this fact in mind. When your camera takes a light reading, the meter averages the scene and adjusts the exposure to produce that mid-tone grey (or 12% luminance, but that's another discussion altogether). If you point the camera at a black stage curtain, it will try to make the black into a mid-tone grey, so it will over-expose. If you point it at snow it will try to make the white into grey, so it will under-expose.

Adjusting exposure

Let's take a moment to explain how exposure is controlled, and what is meant by some of the terminology used.

On all cameras, exposure is adjusted by altering three basic settings; aperture, ISO and shutter speed. Between them they control the exposure of any shot.

Shutter speed is self- explanatory, it is simply the amount of time that the sensor is exposed to light. This is usually controlled by an electrically operated mechanical shutter in front of the sensor that opens and closes very quickly for a precisely measured period of time, usually in the order of a few hundredths of a second. Obviously a shutter speed twice as long lets in twice as much light, one half as long lets in half as much.

The aperture is literally just a hole through which light passes on its way to the sensor. The diameter of that hole can be adjusted to precisely calibrated sizes. A smaller hole lets in less light, and a larger hole lets in more.

These calibrated aperture sizes, for largely historical reasons, are called stops, or f-stops. An aperture setting one stop larger lets in twice as much light. For reasons that are both historical and mathematical, the standard full-stop aperture settings that you are most likely to encounter go f/1, f/1.4, f/2, f/2.8, f/4, f/5.6 f/8, f/11, f/16 and f/22. The smaller numbers refer to larger apertures, and the larger numbers to smaller ones. Many cameras can set apertures in increments of 1/3rd of a stop, but the whole-stop numbers are the ones to remember.

ISO is the amount by which the tones in the image are amplified at the point of capture. A low ISO setting means less light amplification, producing very clean images but needing longer shutter speeds or wider apertures as a result, whilst a high ISO means the image is highly amplified. The practical upshot of this is that you can simulate an increase in the 'gain' of your sensor to give you the option of shorter shutter speeds, and smaller apertures, at the expense of a greater amount of noise in the image.

Let's consider an example. With your camera set to automatic exposure point it at a scene and take a light reading. For the sake of argument, say the light meter sets an aperture of f8 and 1/200th of a second. You can produce the same exposure by increasing the aperture by one stop to f5.6 and halving the shutter speed to 1/400th of a second, because this lets the same amount of light through to the sensor. Similarly, reducing the aperture to f11 and setting the shutter speed to 1/100th of a second will also produce the same exposure.

However by altering one setting without altering the other you will change the exposure. In our example, changing the aperture to f5.6 but leaving the shutter speed at 1/200th of a second will increase the exposure by one stop, or one exposure value (EV), making the picture brighter. Decreasing the aperture to f11 will reduce the exposure by one EV, making the picture darker.

Similarly, changing the shutter speed while leaving the aperture alone will also change the exposure. Double the shutter speed to 1/400th at f8 and you reduce the exposure by one stop, halve the speed to 1/100th and you increase the exposure by one stop.

Once you grasp the concept that all these factors are linked and that one will always affect the other, you are well on your way to understanding exposure and how to get more creative control of your images. ■

Be the master of metering

Know when to use the different types of metering modes

Nearly all digital cameras, from top-of-the-range DSLRs to the humblest budget point-and-shoot compacts, have multiple light metering options. Knowing how and when to use these different metering modes can make a dramatic difference to the quality of your photography; unfortunately most people don't understand what the different modes are for, how they work, or how to use them.

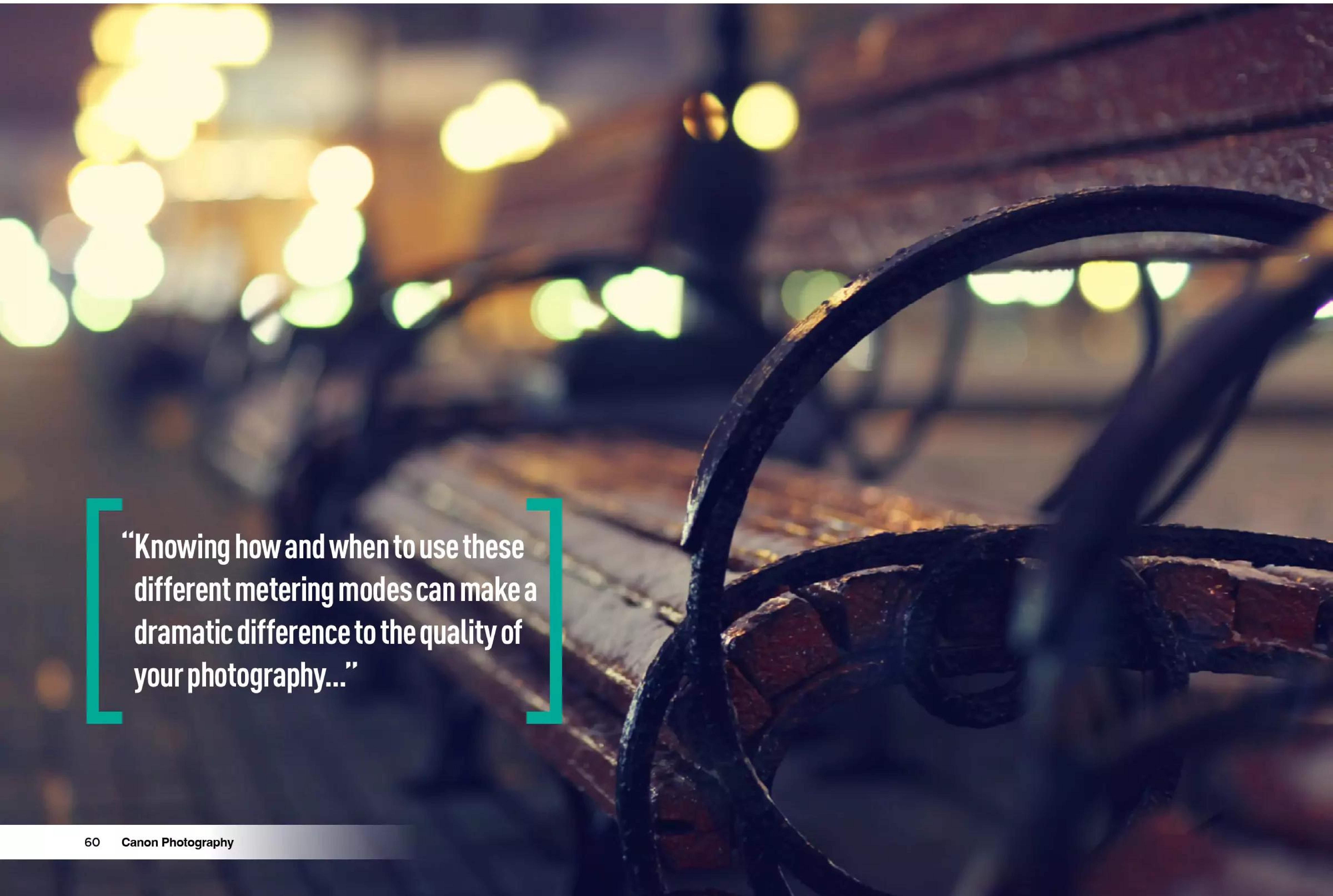
Know your modes

Depending on your camera, you'll find metering options either in the menu or with their own separate control. In cameras with a fully-automatic setting, this will usually disable the metering options; automatically selecting multi-zone metering as the best option for day-to-day scenes and snapshots. The most common light metering modes are found on nearly all digital cameras. They are spot metering, centre-weighted metering and matrix metering. The symbols used for these modes are just about universal. Multi-zone metering is shown by a rectangle filled with a centre spot surrounded by a pattern of shapes; centre-weighted metering is usually shown as a centre spot with shapes above and below it; whilst spot metering is usually a rectangle with just a centre spot.

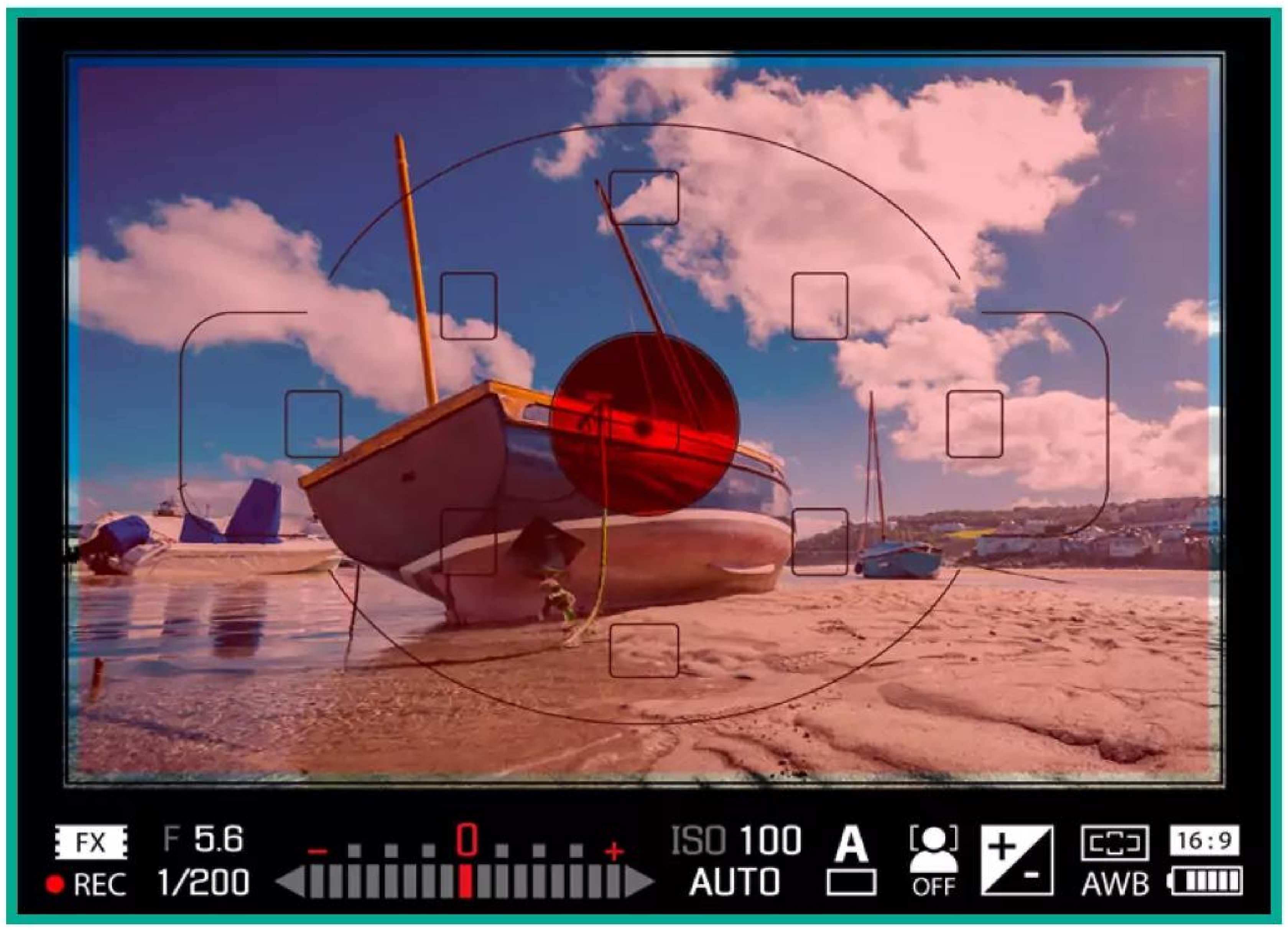
What they do

Matrix metering, also known as Evaluative metering, is usually the default setting and it is a great multi-purpose metering mode for evenly lit scenes and places emphasis around the AF point used while applying appropriate exposure compensation. Centre-weighted behaves a lot like Matrix metering but it place more emphasis on the centre of the image and doesn't take the AF point into consideration. Spot metering is the most accurate by metering the scene over a very small circular area. Partial metering takes the precision of spot metering and expands the size of the circle used to measure the light. ■

Getting your exposure correct at the time of shooting means that you are retaining more detail in the file; this can be enhanced when it comes to post-processing.



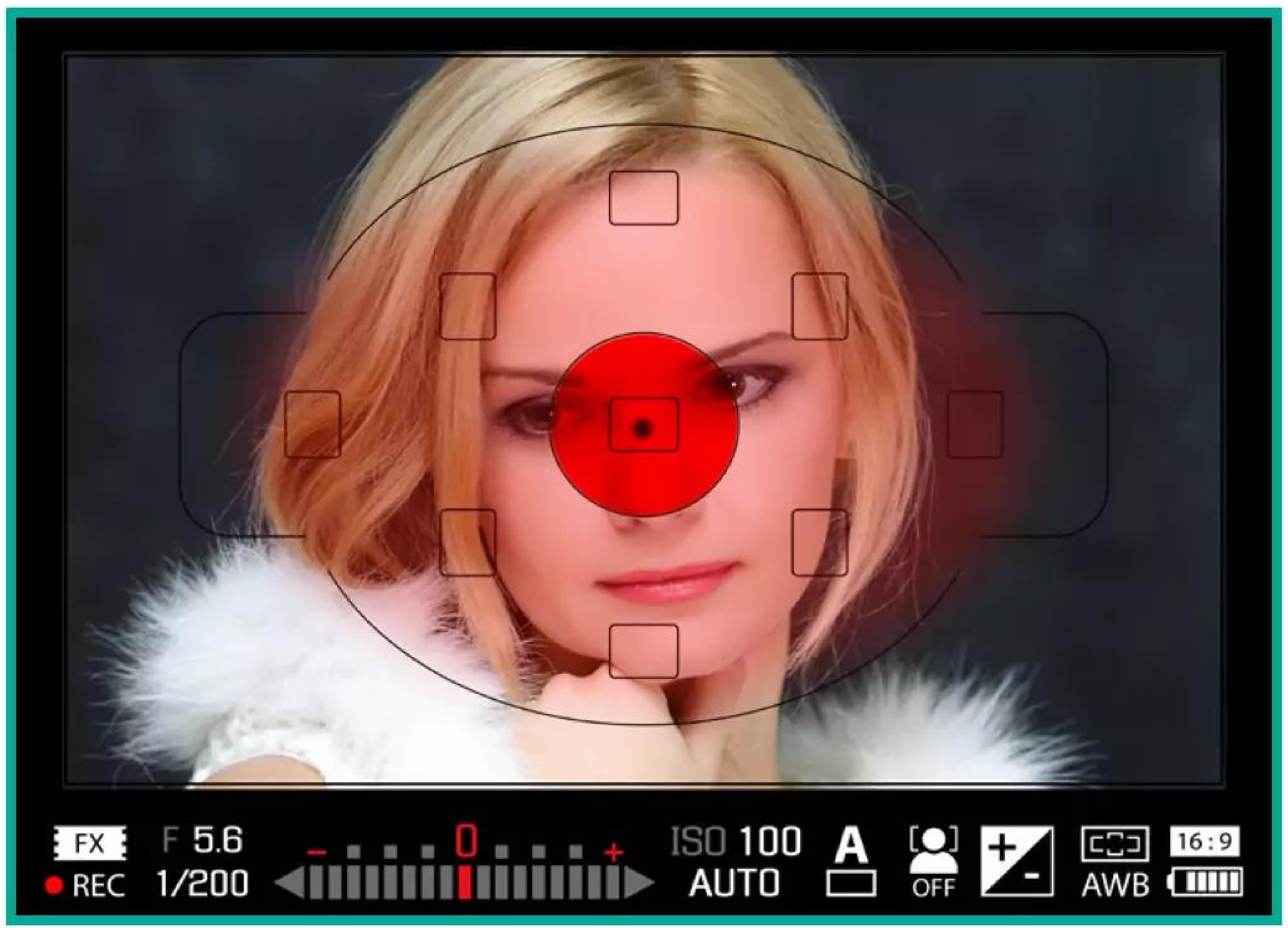
"Knowing how and when to use these different metering modes can make a dramatic difference to the quality of your photography..."


FX
REC
F 5.6
1/200
0
ISO 100
AUTO
A
OFF
AWB
16:9

WB AF·DRIVE ISO·
8000 00(204)
FOCUS
25600
AF-ON

Matrix or Evaluative metering

This mode is great for evenly lit scenes where there are not a lot of tonal variations. It meters the whole scene and is usually the default metering mode on a camera.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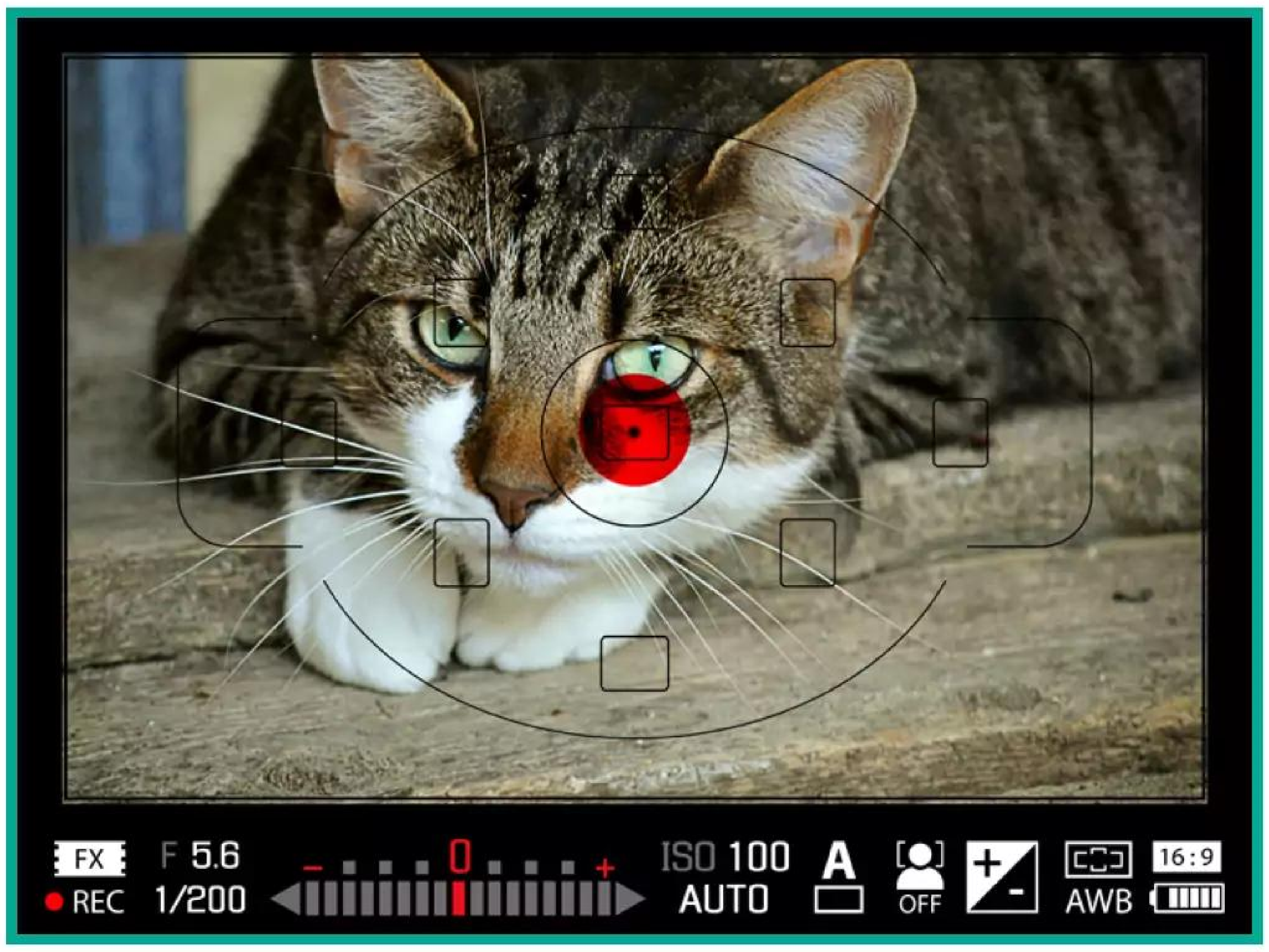
F 5.6
1/200
0
ISO 100
AUTO
A
OFF
AWB
16:9

WB AF·DRIVE ISO·
8000 00(204)
FOCUS
25600
AF-ON

Centre-weighted average

Since this mode concentrates on the central portion of the frame, it makes it perfect for portraits and head shots. Details around the edge of the frame are not metered.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ISO 100
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A
OFF
AWB
16:9

WB AF·DRIVE ISO·
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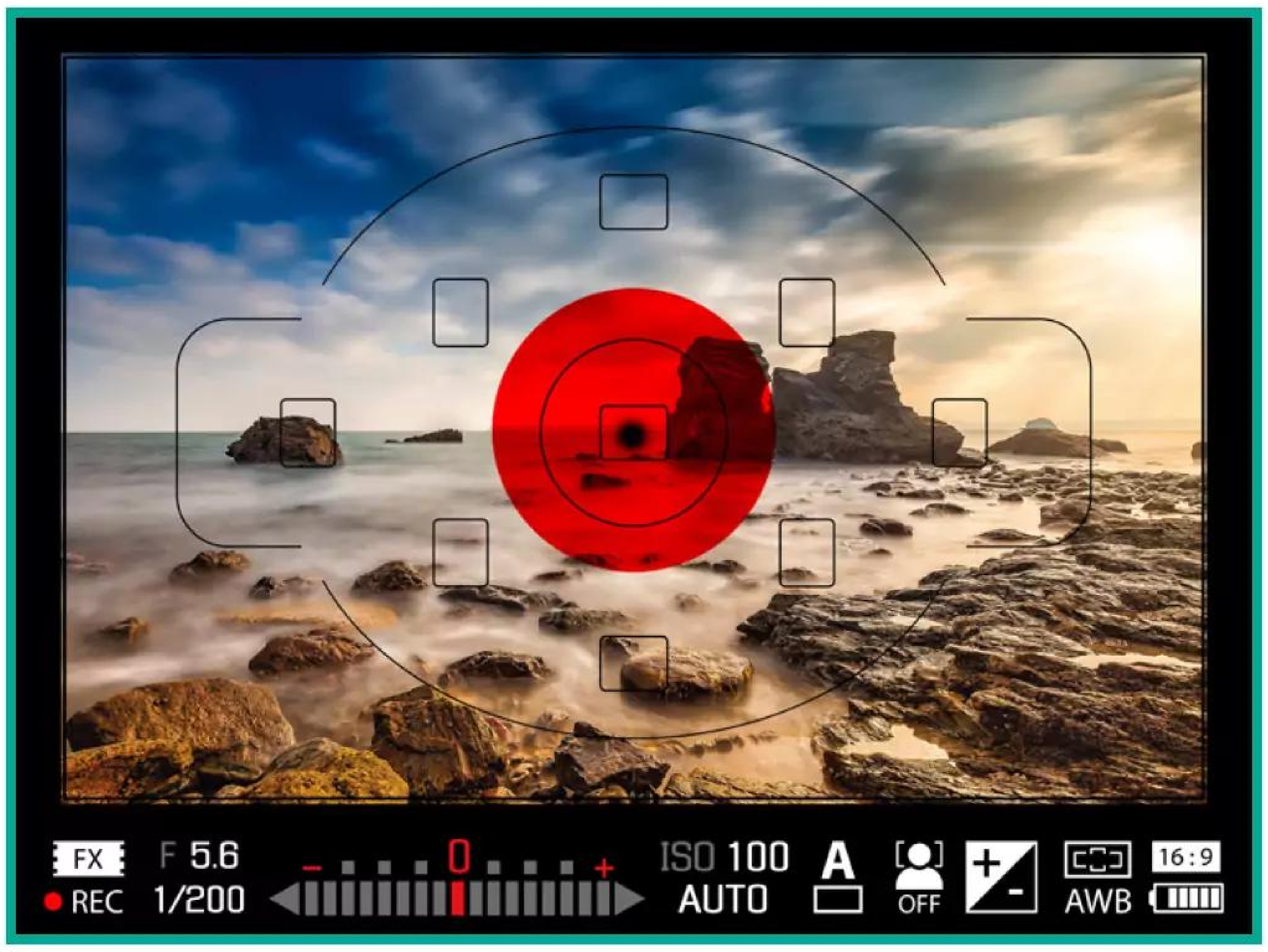
FOCUS
25600
AF-ON

Spot metering

When shooting scenes with large tonal variation, spot metering allows you to pick exactly which part of the scene you want to accurately meter for.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F 5.6
1/200
0
ISO 100
AUTO
A
OFF
AWB
16:9

WB AF·DRIVE ISO·
8000 00(204)
FOCUS
25600
AF-ON

Partial metering

Essentially, partial metering is an expanded version of the spot metering mode. This makes it easier to use although the metering is not quite as precise as the spot meter mode.

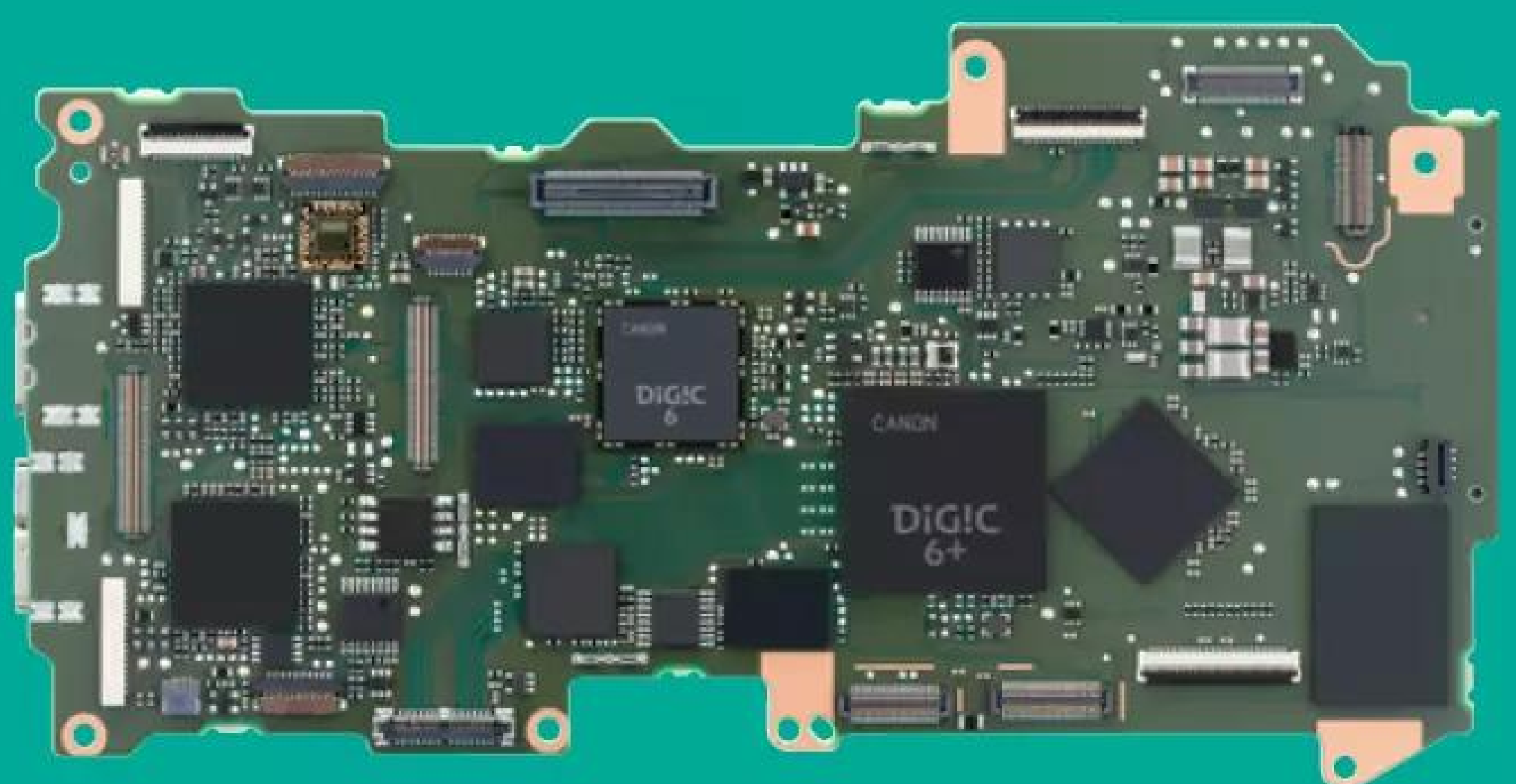
ISO and image noise

High ISO gives you faster shutter speeds in low light, but there's a price to pay

Anyone who has owned a digital camera for a while will be familiar with the concept of image noise. It's that grainy distortion that spoils pictures shot in low light conditions with high ISO settings. What is image noise, where does it come from and what can be done to prevent it?

All electronic devices generate noise. The background hiss of a radio, the sound of an over-amplified electric guitar, or the interference on a badly tuned television, all of these things are electronic noise, and so is the noise seen in a digital photograph.

This noise comes from a variety of sources. Some of it is generated by imperfections in the electronic components, or as a by-product of their normal operation. For instance, capacitors generate a small amount of noise as they charge and discharge. Electronic components can also be affected by environmental noise, such as the electrical fields that constantly surround us.



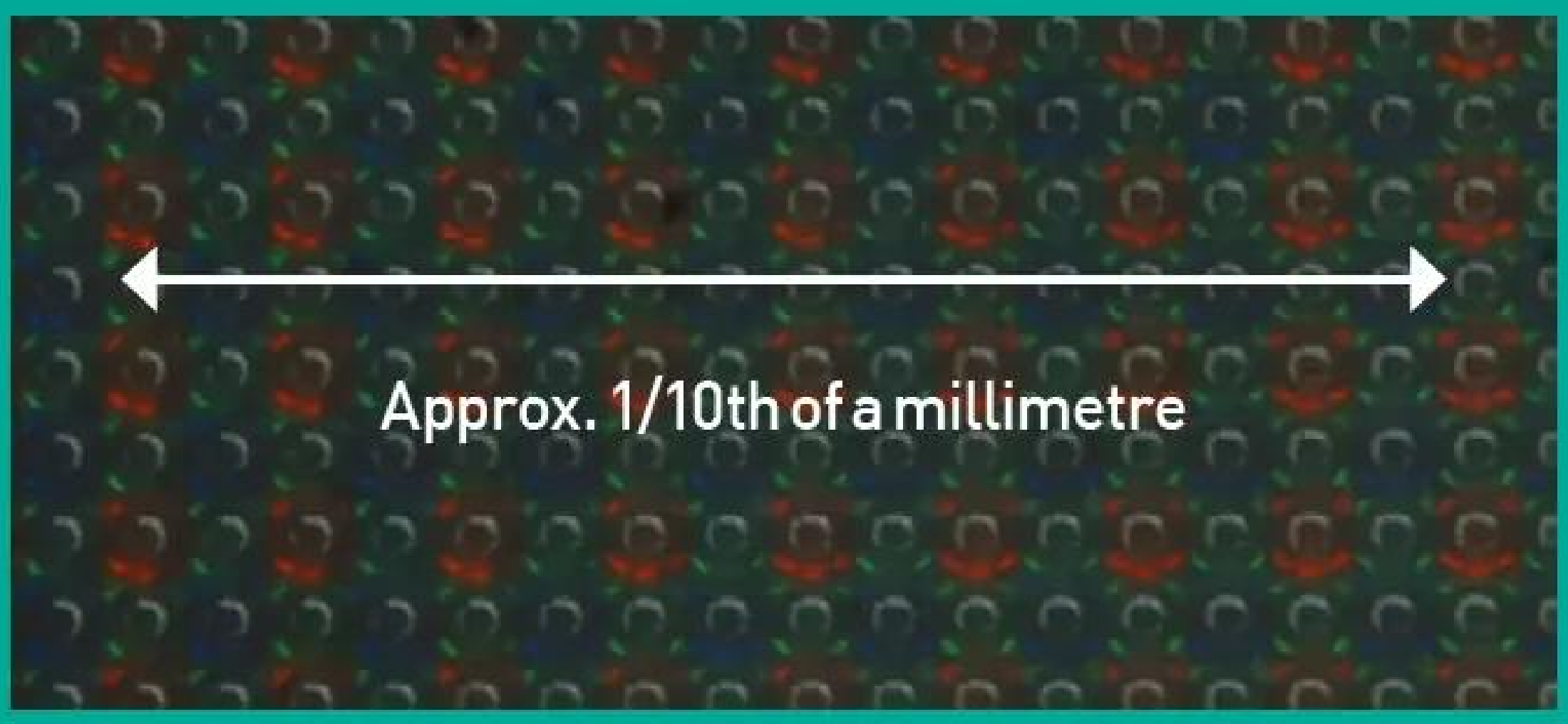
This is the main circuit board from a Canon EOS 5D MkIV digital SLR, showing the powerful DIGIC6 and DIGIC 6+ image processing chips.

Circuit noise can be minimised by superior manufacturing and rigorous quality control. Unfortunately some cheaper camera brands, or even budget models from better-known brands, may use components of lower quality, which is why these types of camera generally produce noisier images than the more expensive models.

Sensor noise

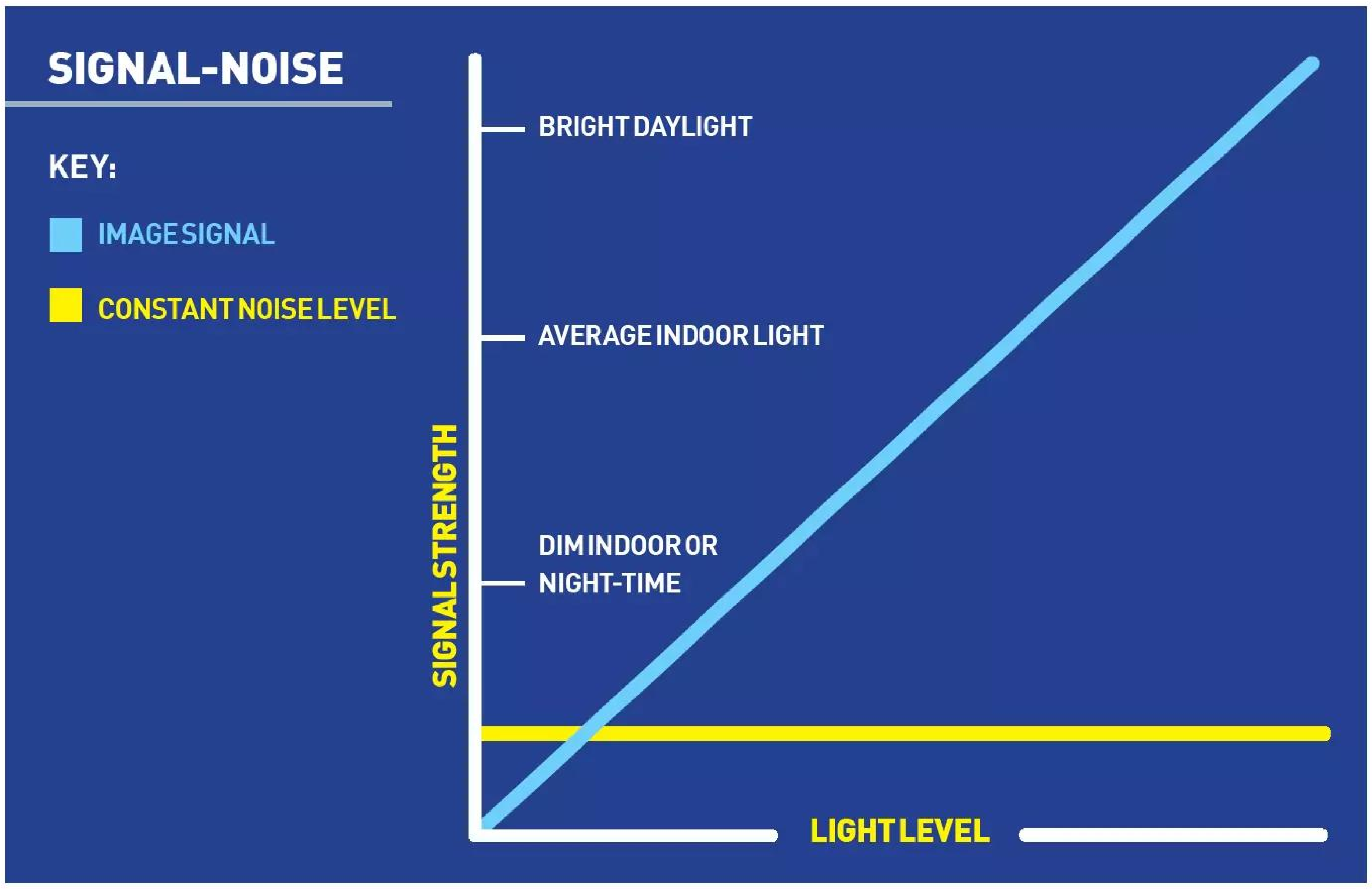
The other main source of image noise is the sensor itself, and in most cases this is unavoidable. The individual photocells on a digital camera sensor are incredibly small, especially with high-resolution compact camera sensors.

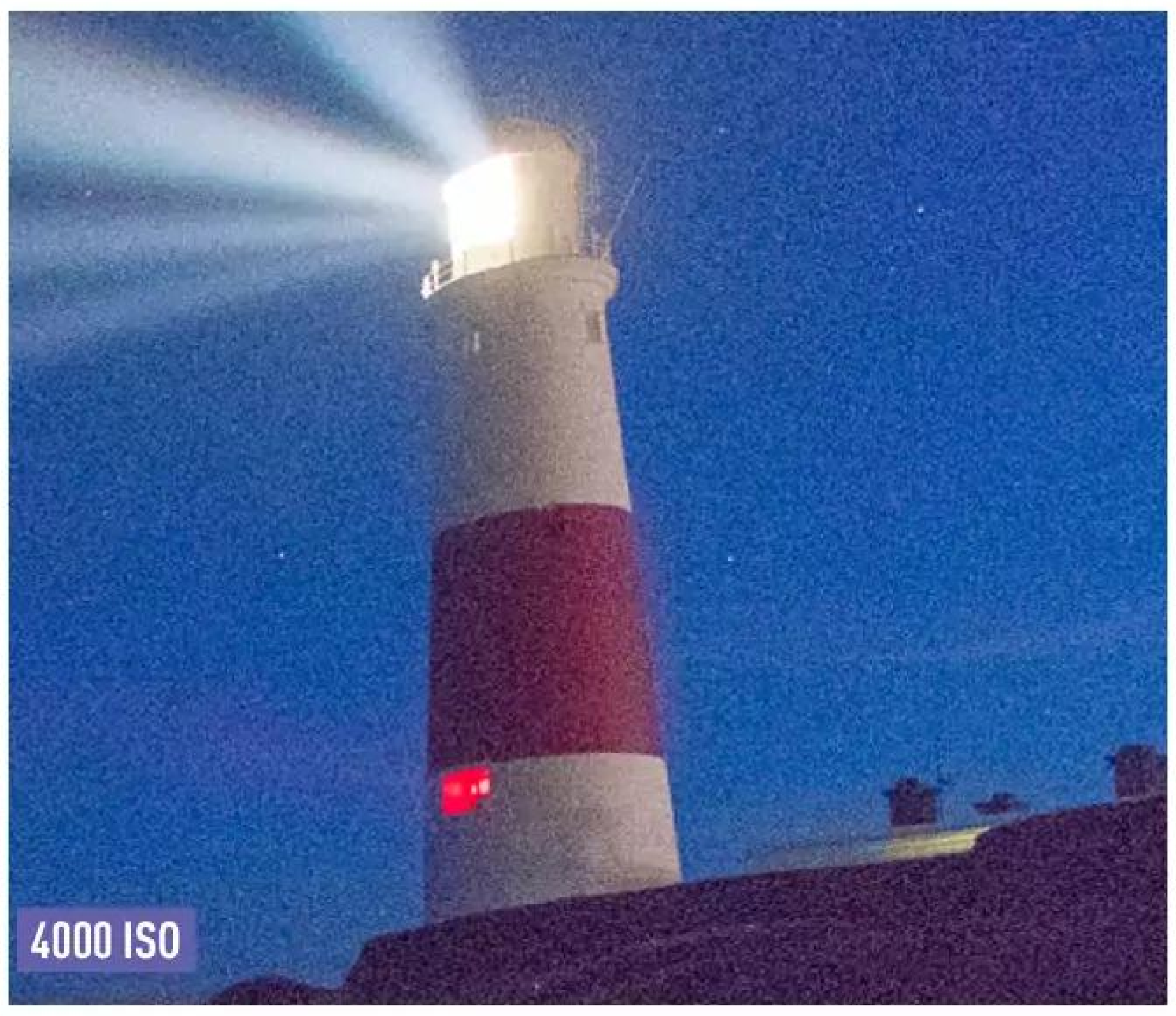
Most compact camera sensors have over 10 million individual photocells crammed into an area of less than 30 square millimetres. These photocells are so small that in low light conditions they may only be collecting a few thousand photons (individual light 'particles') during an exposure, so the level of the electrical signal produced by the cell can be affected by random statistical fluctuations in photon density. This is the main reason that physically larger sensors are much better than smaller ones. The individual photocells are larger and collect proportionately more light during the exposure producing an inherently higher signal to noise ratio.



Actual microscope photograph of the surface of a Nikon CCD, showing the Bayer mask filter and microlenses

The level of noise produced by the sensor and other components in the camera is usually constant and at a fairly low level. When taking photographs in good light the level of the signal vastly outweighs the level of noise; in other words the signal to noise ratio is very high, and consequently noise isn't a problem. The



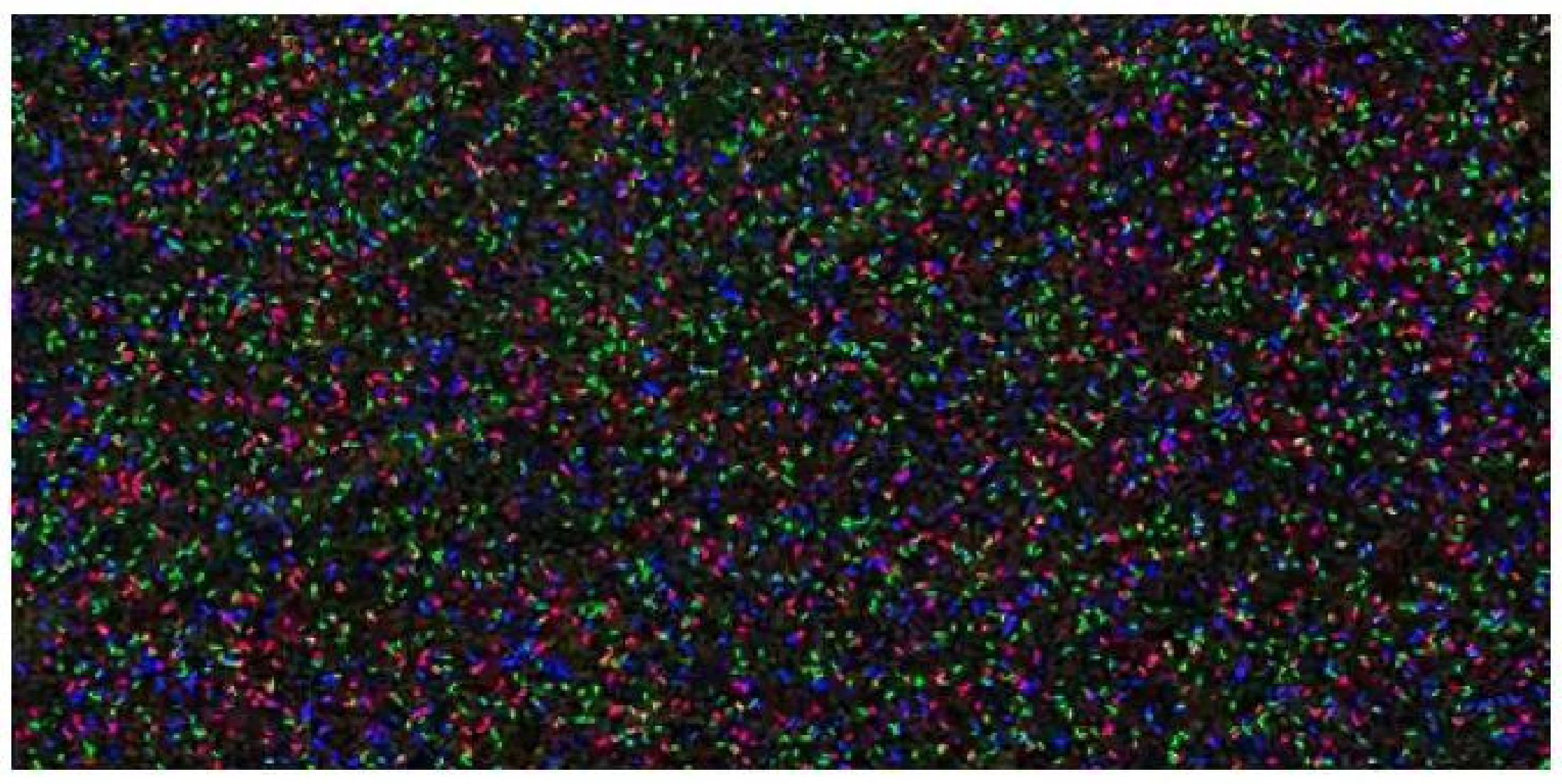


> “A higher sensitivity increases the amount by which the signals from the sensor are amplified... unfortunately the noise gets amplified as well.”

problems start when shooting in low light, as the level of the signal drops nearer to the constant noise level, producing a lower signal to noise ratio. At extremely low light levels the signal may be entirely drowned out by the noise.

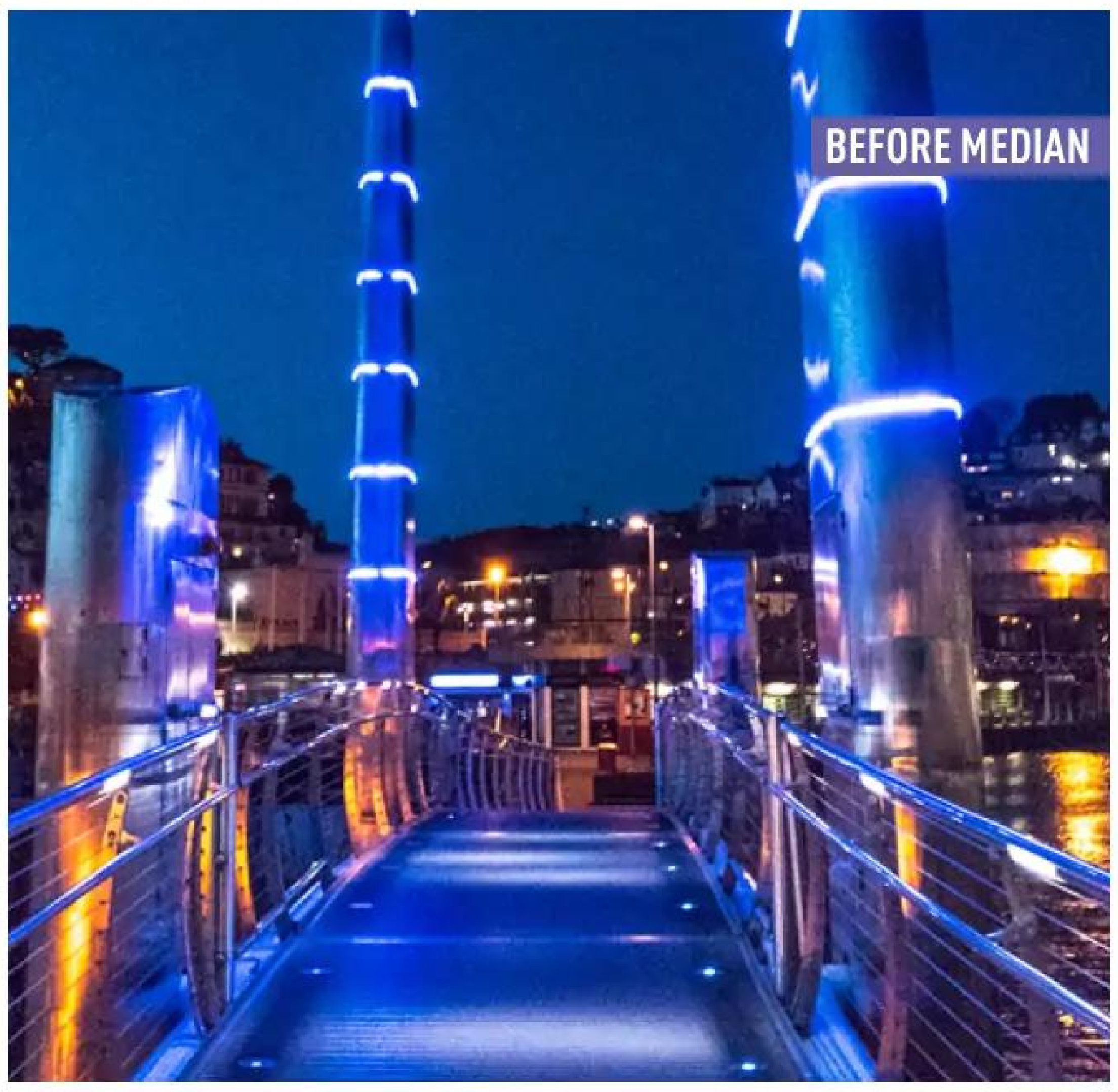
This problem is made worse when shooting at higher ISO settings. When we set a higher sensitivity we are increasing the amount by which the signals from the sensor are amplified, and unfortunately the noise gets amplified as well. If the signal to noise ratio was already very low then this just produces more noise without improving the image. This is why high ISO images are always more noisy than ones taken at lower settings.

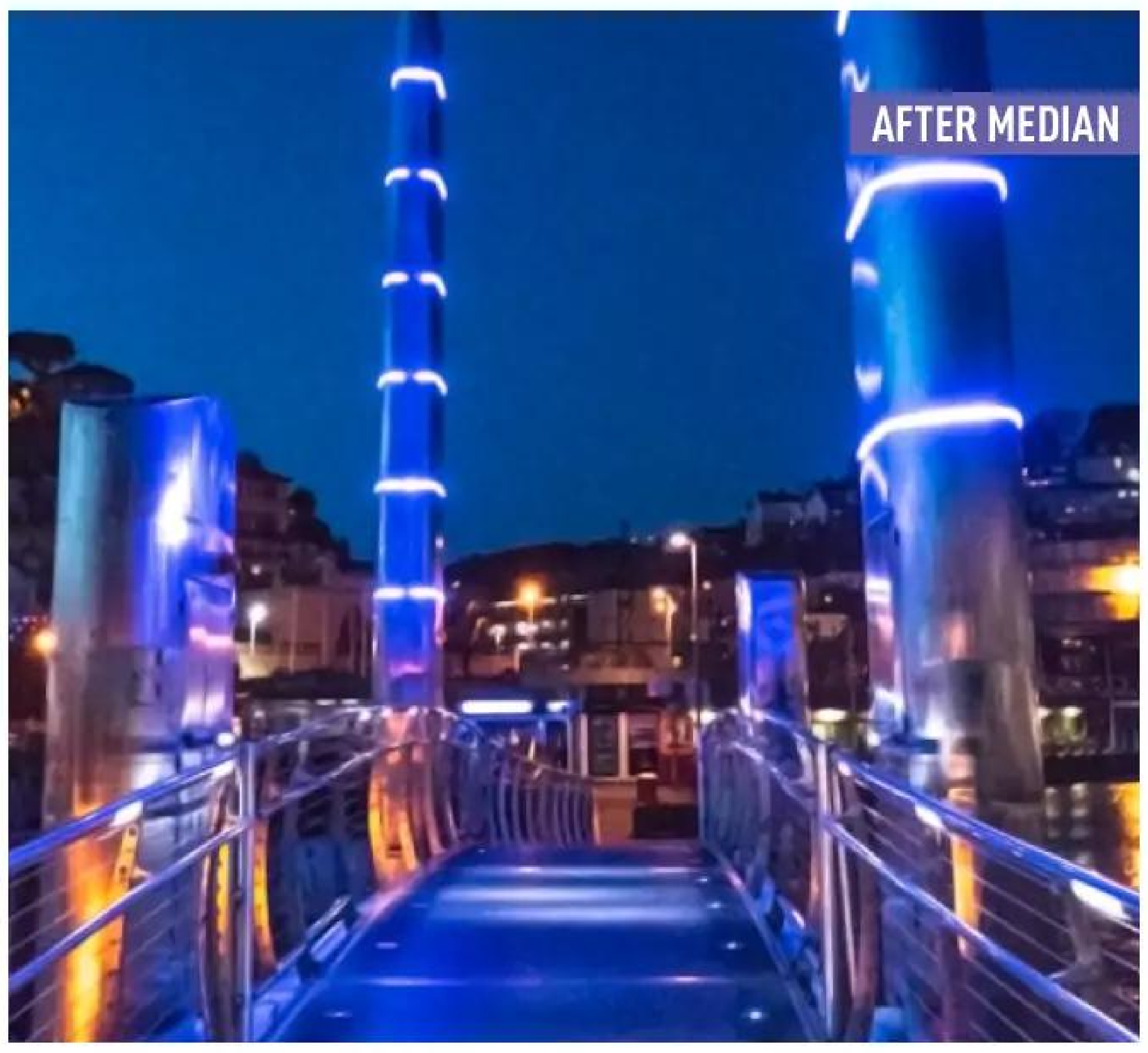
Another type of sensor noise can also be a problem when using exposures longer than a couple of seconds. Sometimes the photocells that make up the sensor may not all respond to light to an equal degree, causing single pixels to appear very bright or very dark. The charge build-up over a longer exposure makes this problem more noticeable. Since the pattern of these “dead” or “hot” pixels is usually consistent from one frame to the next this type of noise is remedied by applying a filter during image processing. Most modern cameras do this automatically but it can be a problem on older models. Images taken on older cameras can show a lot of “hot” pixels, especially during long exposure photographs with no long exposure noise reduction. Below is an example of how bad it can get.



Noise reduction

Cameras reduce image noise by using smoothing filters during image processing. The most commonly used is called a Median filter. This works by comparing each pixel to the ones surrounding it, and if it has a brightness that is different from its neighbours then it is replaced by a new pixel with the average value of the nearby pixels. This eliminates noise effects, but also reduces detail and contrast. Compare these next two images. The first is unfiltered, the second has had a median filter applied. The second image is “cleaner”, but as you can see the level of detail has been greatly reduced.



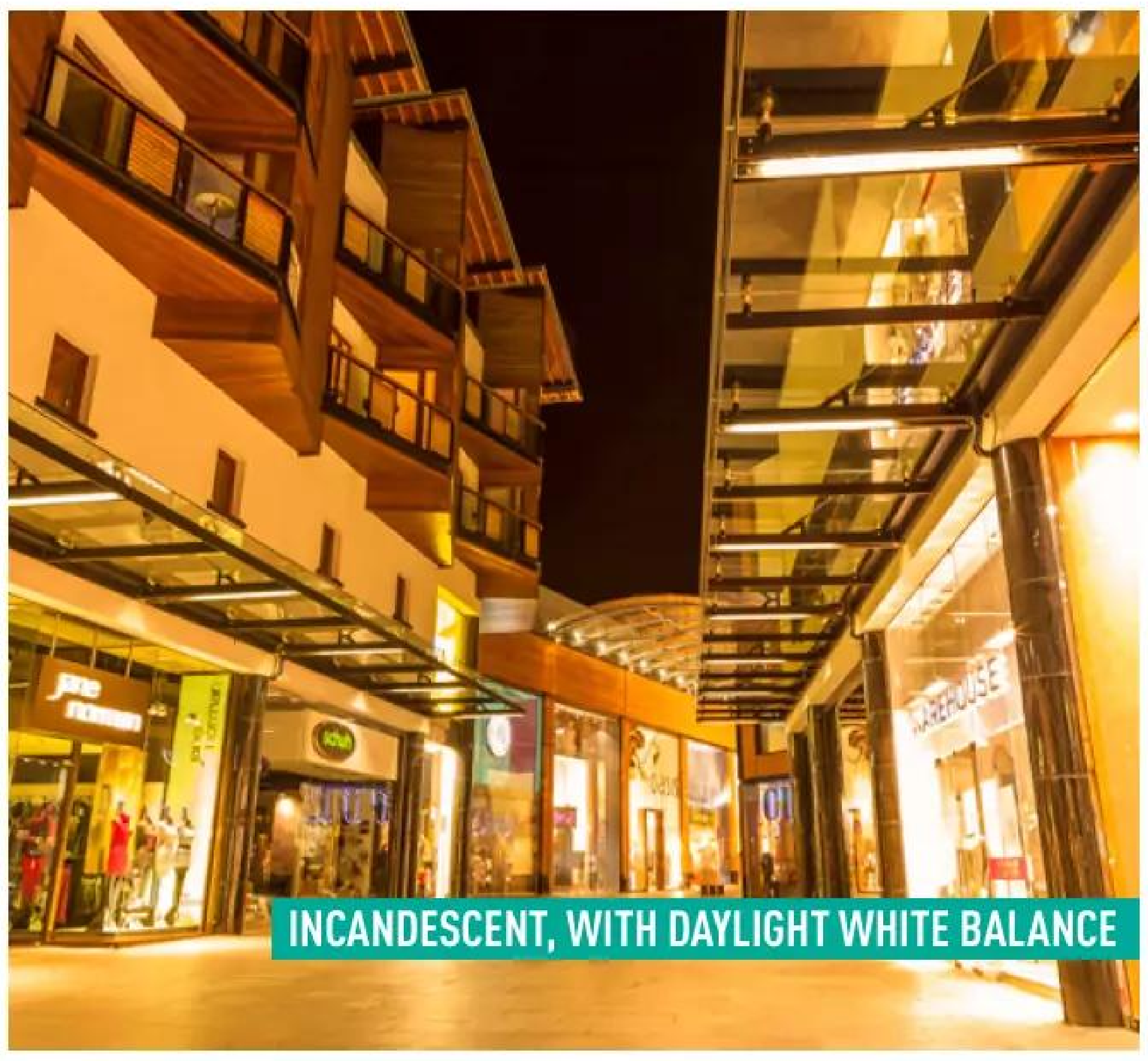


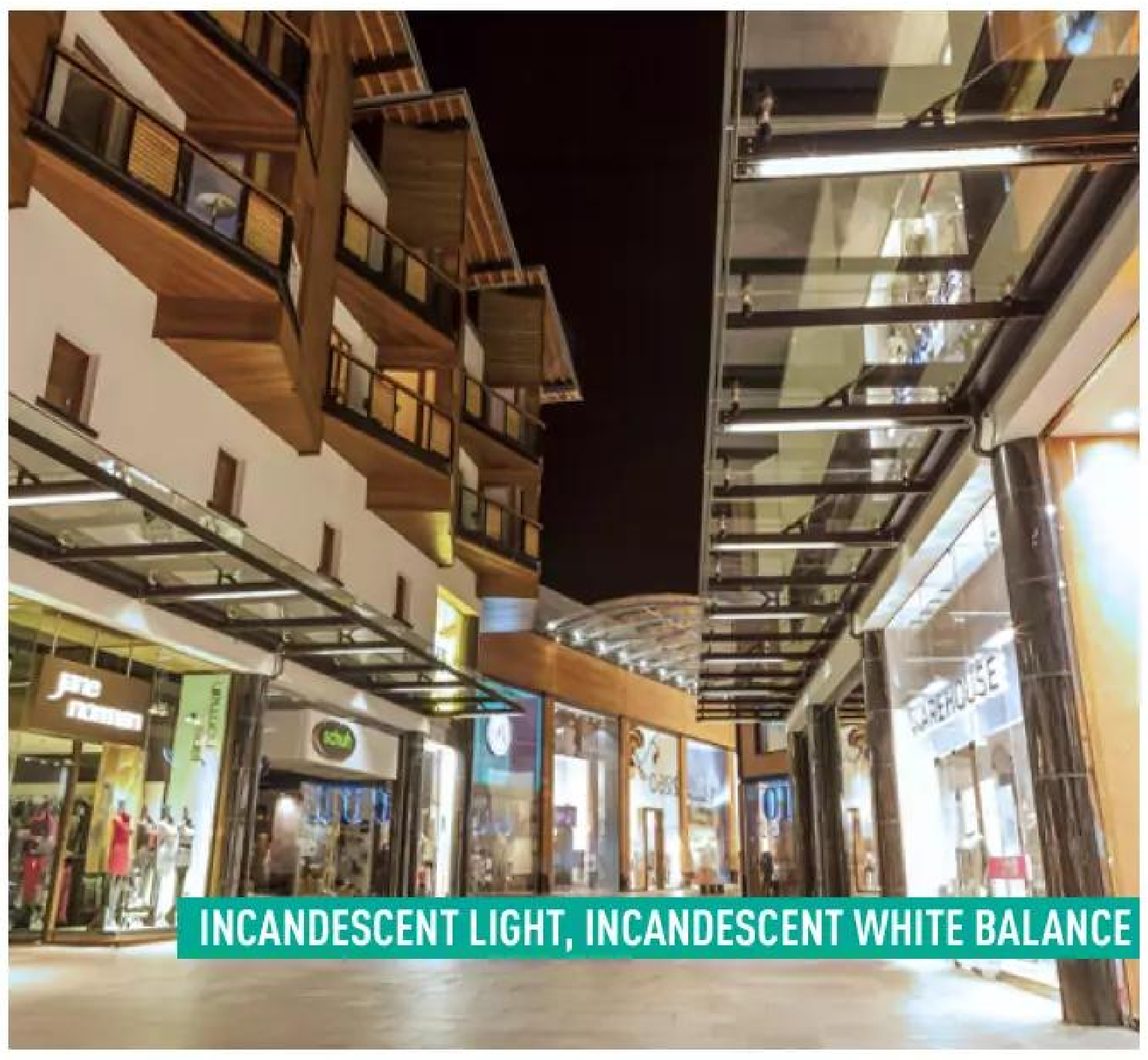
Another type of noise reduction is called “pixel binning”, although this is less widely used in recent digital cameras. In this process, the signals from groups of four, nine or even 16 adjacent photocells are grouped together into a “super pixel”. This has the effect of increasing the signal to noise ratio, but of course it also reduces the effective resolution of the image. It increases the signal to noise ratio, but it also reduces the quality of the image.

The only effective remedy to image noise is to use larger, more sensitive photocells. Digital SLRs have a major advantage in this area, since they have physically larger sensors. Compact camera sensor technology continues to improve, both in image processing and sensor design. We will undoubtedly see further advances in the future, but for now image noise is something we just have to accept. ■

White balance

White may not be as white as you think


INCANDESCENT, WITH DAYLIGHT WHITE BALANCE


INCANDESCENT LIGHT, INCANDESCENT WHITE BALANCE

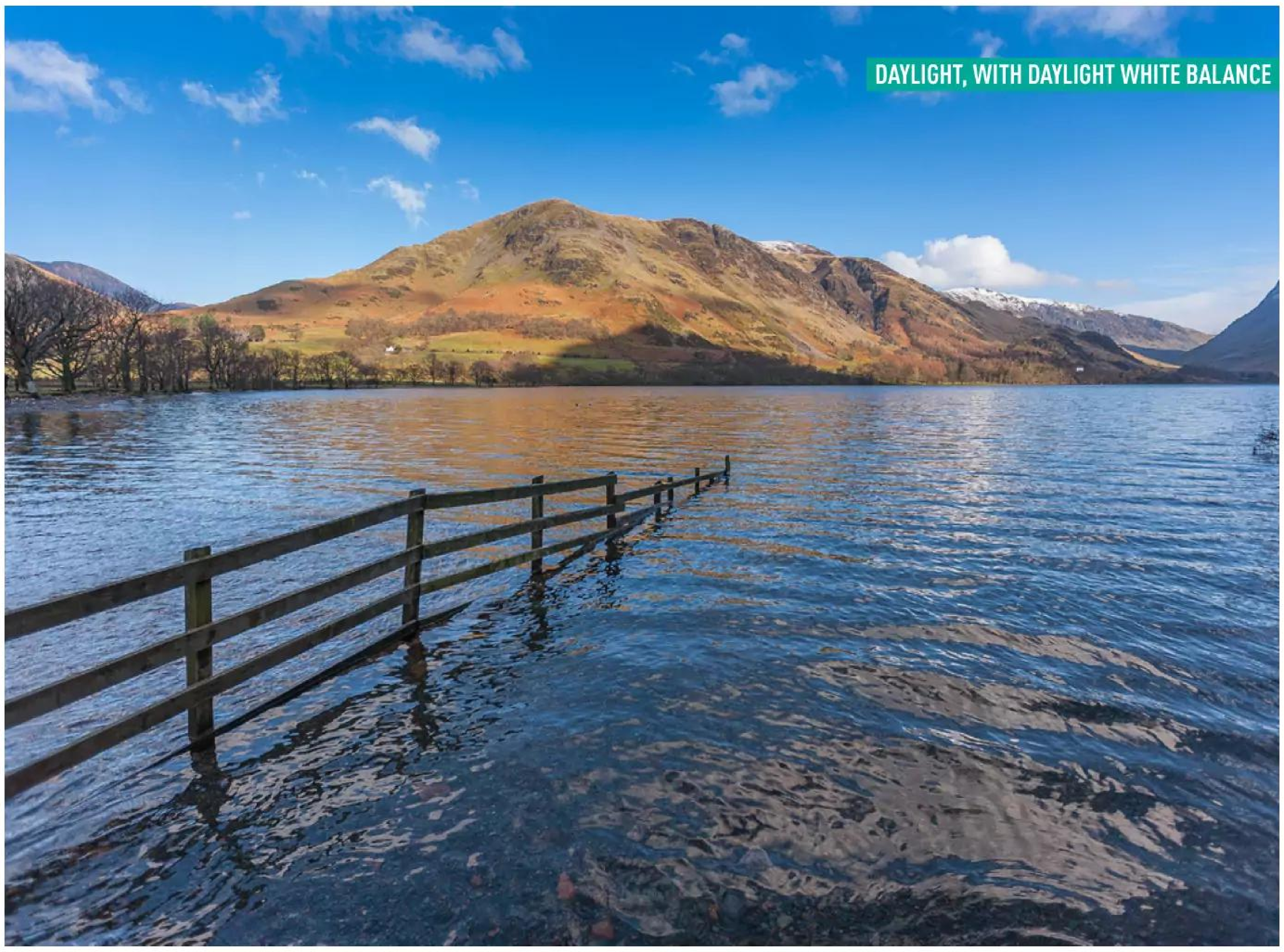
When you look at, for example, a sheet of white paper, your brain adjusts what you see so that it matches what you are expecting to see. However your digital camera doesn't have any expectations, and the colour that it "sees" is the actual colour present in the scene.

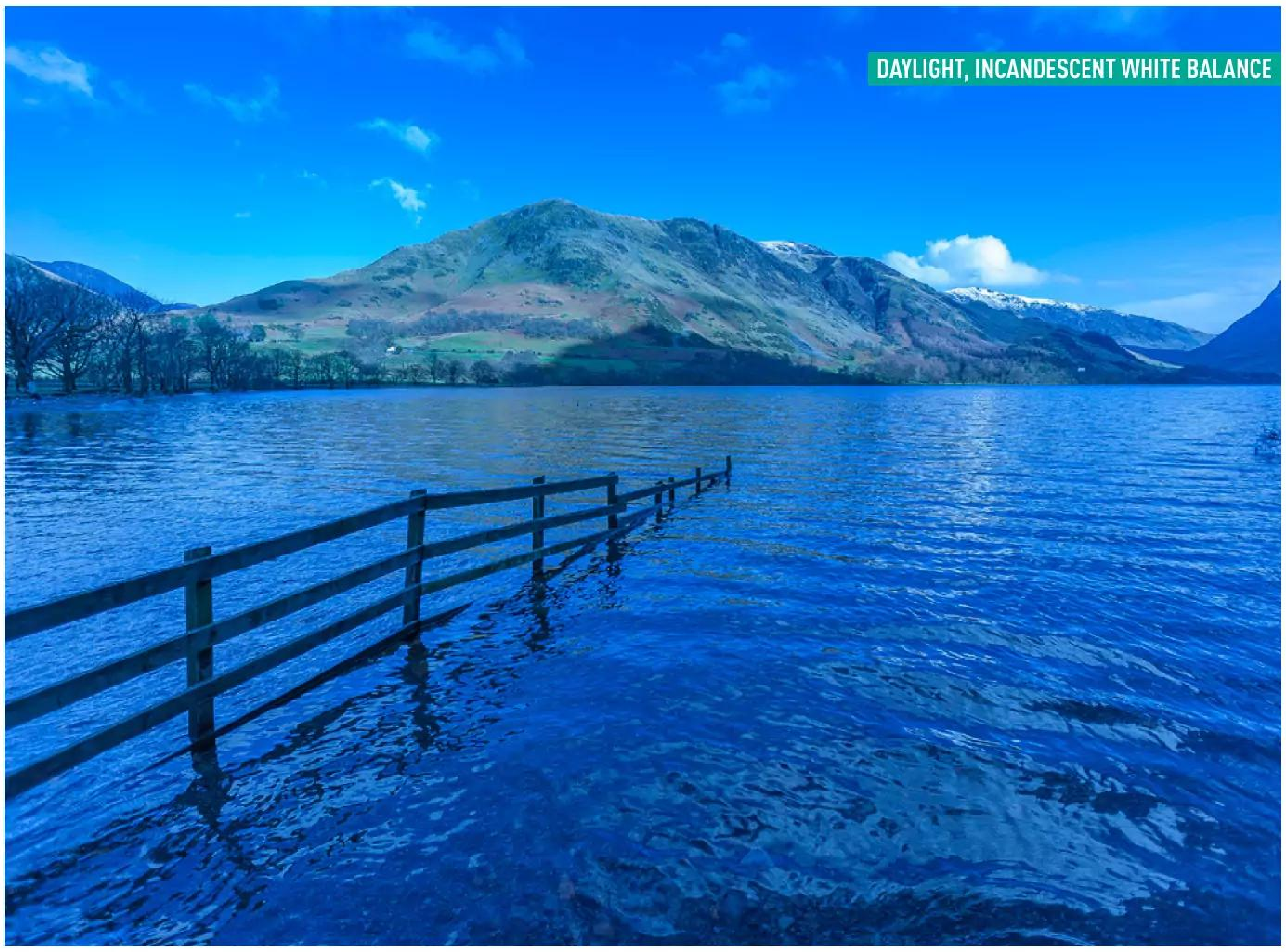
'White' light visible to humans can actually vary in colour from reddish orange to greenish-blue. This variation is usually described as a temperature range, with warm being the red end and cold at the blue end, and is usually measured in degrees Kelvin using a colour meter. Confusingly, the higher the colour temperature, the cooler the tone and vice versa.

We perceive various shades of white light illuminating a scene as neutral, a clever trick performed by our brains to maintain a sense of normality. Digital cameras can perform the same trick using a feature called automatic white balance. The camera evaluates the scene through the lens, analysing areas it guesses should be white (highlights) and black (shadows). More expensive cameras have a more reliable ambient white balance sensor that measures the temperature of general, focused light. However these automatic systems can be fooled, so most cameras give you the option of setting the white balance manually, either from pre-sets that cover most normal lighting conditions or by making an accurate measurement of the prevailing lighting conditions.

In the example pictures on this page you'll see an image with ordinary incandescent light bulbs, also called tungsten lighting. As you can see, when the camera is set to the warm artificial light white balance setting that suits this lighting, the light areas of the scene are neutral. The same scene looks very different when the camera's white balance is set to normal daylight colour temperature. Now there is a distinct reddish-orange cast. Light bulbs can shine with various colour temperatures. Cheap traditional, low wattage light bulbs tend to be the warmest in colour, while low voltage halogen bulbs are cooler in tone.

Another example is a typical noon day outdoor scene where the ambient white light temperature is cool. When the camera's white balance setting matches the cool tone of the brightness of the sun, everything looks quite normal. On the other hand, if the camera has been set for tungsten artificial light, the scene appears to have a very


DAYLIGHT, WITH DAYLIGHT WHITE BALANCE


DAYLIGHT, INCANDESCENT WHITE BALANCE

blue cast. Sunlight, like artificial light, can vary quite considerably in colour temperature. Early morning and late afternoon daylight is warmer as cooler components of the light are filtered out because it has to shine through more atmosphere and its pollutants as the sun is nearer the horizon. Meanwhile, cloudy and overcast conditions deliver a cooler light because warmer components are filtered out by the cloud.

Our third example is lit with fluorescent lighting, and presents an even harder challenge for your digital camera. The visible spectrum of fluorescent light is not a nice smooth line, it's full of peaks and troughs. Some fluorescent lights have a green cast and others a pink cast. These differences are visibly evident where strip lights of different tone have been fitted side by side. So-called daylight tone fluorescent lights are not equivalent to real daylight. Better digital cameras will have a number of presets for fluorescent light to help you match the white balance in these conditions more accurately. In our example here, the fluorescent light is a greenish yellow in tone.

Know your camera

Nearly all digital cameras offer white balance adjustments accessible either from a settings menu or, typically on higher spec cameras, via an external button in conjunction with an LCD display.

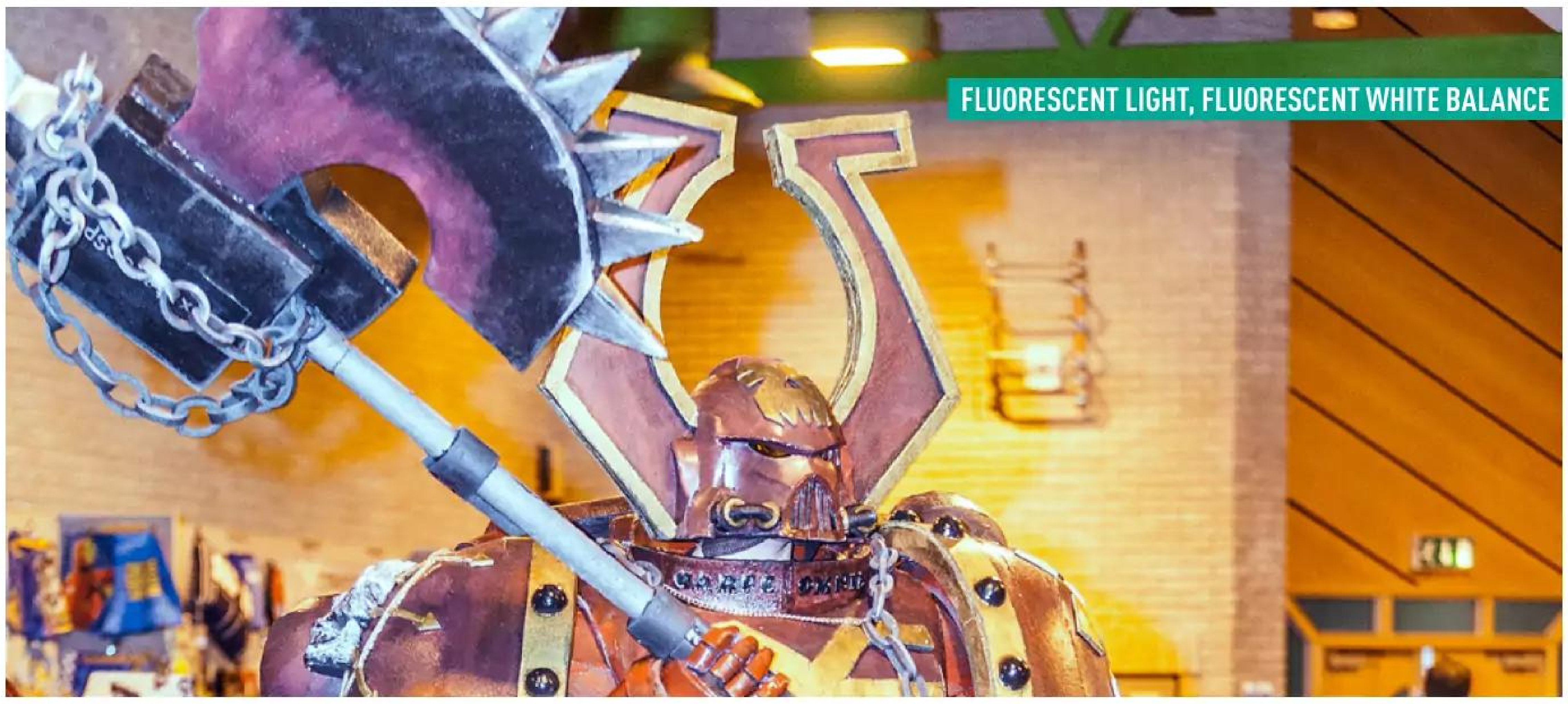
Manual white balance

Some cameras can let you calibrate the white balance setting manually. You simply hold a white card in front of the camera lens and press a white balance calibration button. The camera adjusts its white balance setting until the card is reproduced neutrally. Beware of this setting remaining on as when you return to normal shooting conditions it may spoil your pictures!

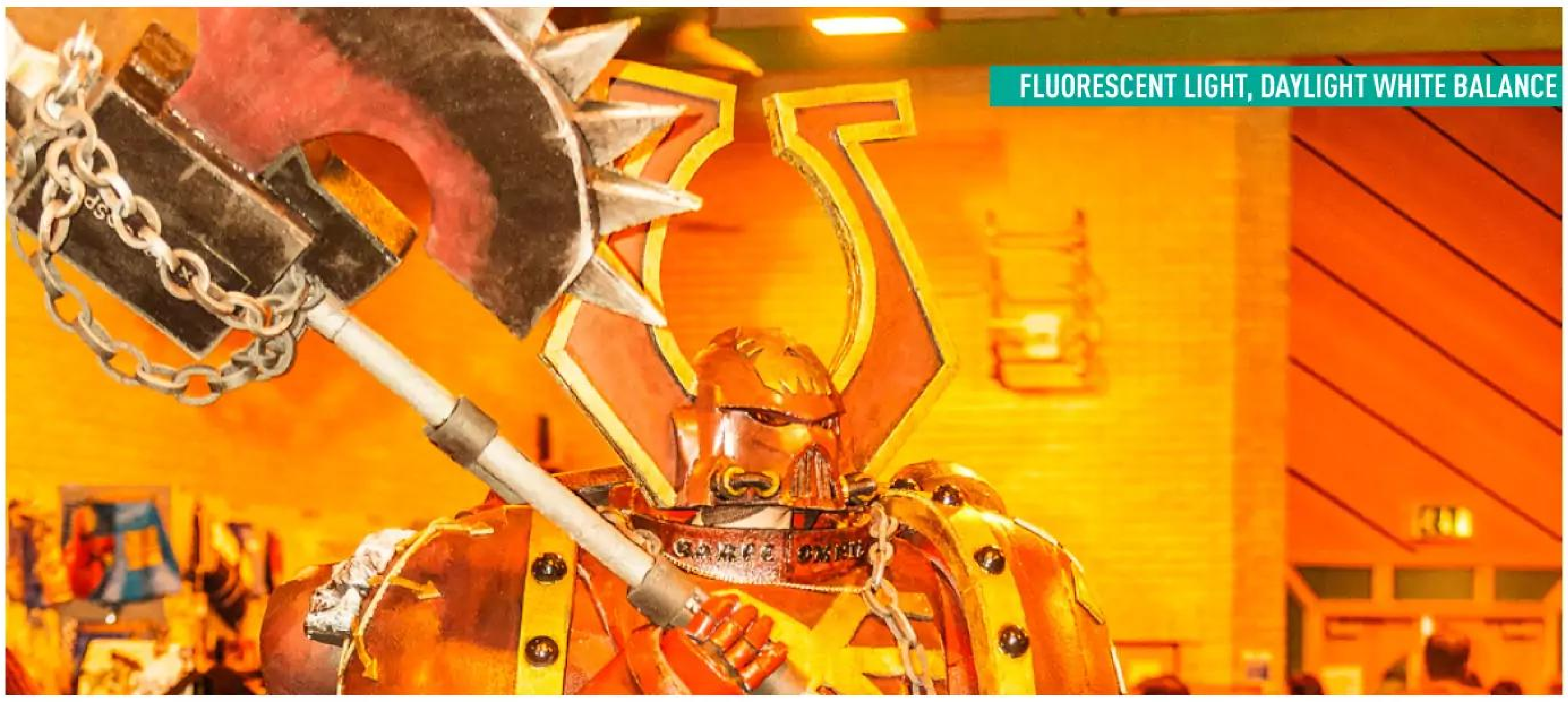
Preset white balance

All digital cameras offer a choice of white balance presets, and some cameras let you choose the setting via colour temperature values. Some really advanced cameras let you bracket white balance settings, or take a series of shots with settings above and below your standard setting. ■

> "We perceive various shades of white light illuminating a scene as neutral, a trick performed by our brains to maintain a sense of normality."



FLUORESCENT LIGHT, FLUORESCENT WHITE BALANCE



FLUORESCENT LIGHT, DAYLIGHT WHITE BALANCE

TYPICAL WHITE BALANCE VALUES

TUNGSTEN/ARTIFICIAL

2500-3000K

Indoor lighting using traditional non-fluorescent light bulbs.

FLUORESCENT

3500-5500K

Include strip lighting and modern compact fluorescent lamps

NORMAL DAYLIGHT

5500-6000K

Typical mid-morning to mid-afternoon conditions at sea level.

CLOUDY/OVERCAST

6000-8000K

Hazy or overcast conditions.

CLEAR BLUE SKY

10,000-15,000K

Exceptionally clear mid-summer or high altitude conditions, especially snow scenes.

TIPS FOR BETTER PHOTOS

Top tips that can help you take better photos

It is fairly common for us to rely on the automatic settings provided allowing us to simply point-and-shoot to take a photo. We feel that an automatic setting has its place but it does disconnect you from the actual process of taking a photograph. To be able to take your shots to the next level, you need to understand how to take control of your camera, see what makes a good shot and start taking the photos that you really want to capture.

There are a number of hints and tips we can pass on that can help you evolve as a photographer. Many of those tips cover shooting techniques, others may simply be advice about equipment and understanding a little more about your camera. You don't have to use them all but pick out a few that work for you, develop them and make them a part of your creative photographic process and they will stand you in good stead as you progress your skills. ■

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68 Buy a tripod
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69 Stop the shakes
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73 Get on their level

1

Choose the right camera

When you're looking to buy a new camera for your photography, make a list of your requirements and set yourself a budget. Don't forget to allow for accessories such as lenses, a tripod and cleaning kit if you need them. Don't fall in to the trap of thinking that a more expensive camera will make you a better photographer. You're much more likely to improve your technique by overcoming the limitations of cheaper kit than by spending more money than you need to.

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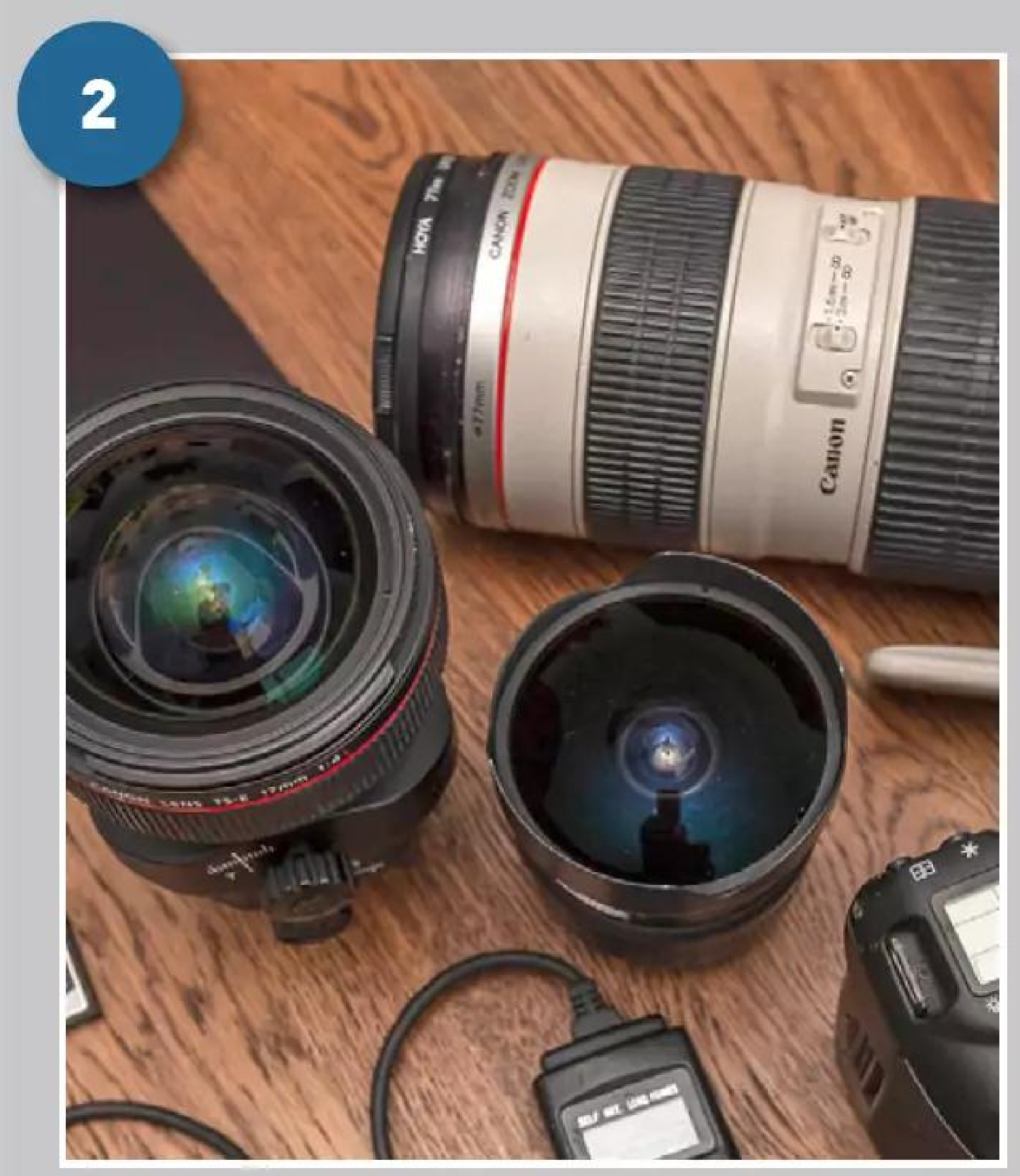

Choose the right lens

If you're buying a compact system camera or DSLR, it will probably come with a standard telephoto lens that is ideal for general photography and snapshots but there is a wide variety of special lenses available for other types of photography. If you like to shoot landscapes, get a good wide-zoom lens but avoid super-wide lenses as these will distort the image. If you want to shoot wildlife, you'll need a high quality fast telephoto but this will be expensive.

3

Buy a tripod

The quickest way to improve your photography is to invest in a decent tripod. For the best combination of strength, rigidity and portability, the ideal choice is carbon fibre. Carbon fibre tripods start at around £120 ($175, €165) and can cost ten times more, so if that's too expensive get a good quality aluminium one. Features to look for include a ratcheted centre column, portrait-format tilt and all-metal construction. Avoid ones with plastic heads, as they are seldom rigid enough to prevent camera shake on long exposures.

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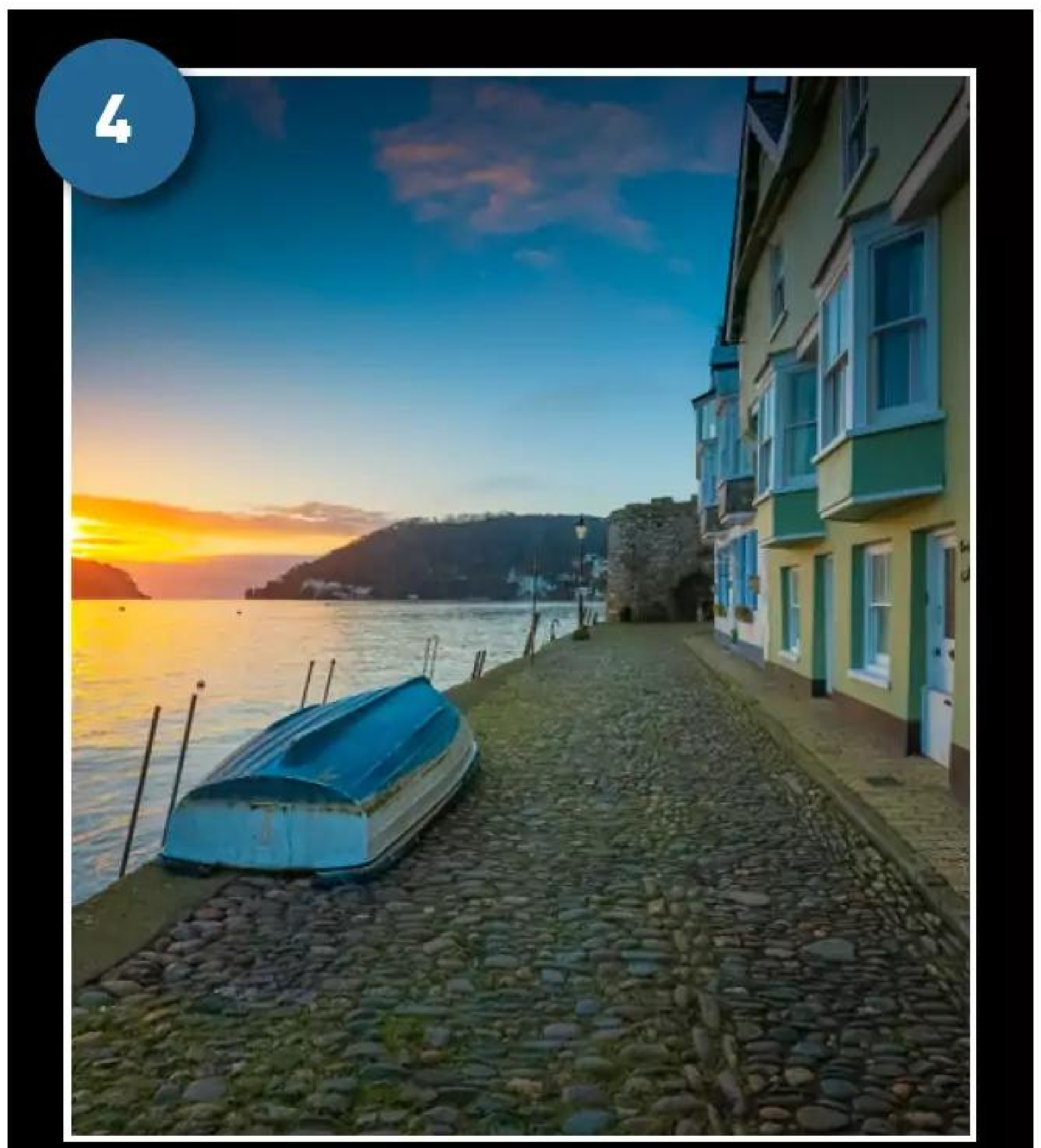

Early bird

Shooting a landscape in bright midday sun is fine but if you really want your shots to shine, you'll need to get up early and catch the light available just before the sun rises, and as it climbs above the horizon. The shadows are long, giving definition to objects and the light has that special golden ethereal quality. The same is true at the opposite end of the day, at sunset. The period of time around sunrise and sunset is called the golden hour. Simply switching the time you take photos can have a dramatic improvement on your shots.

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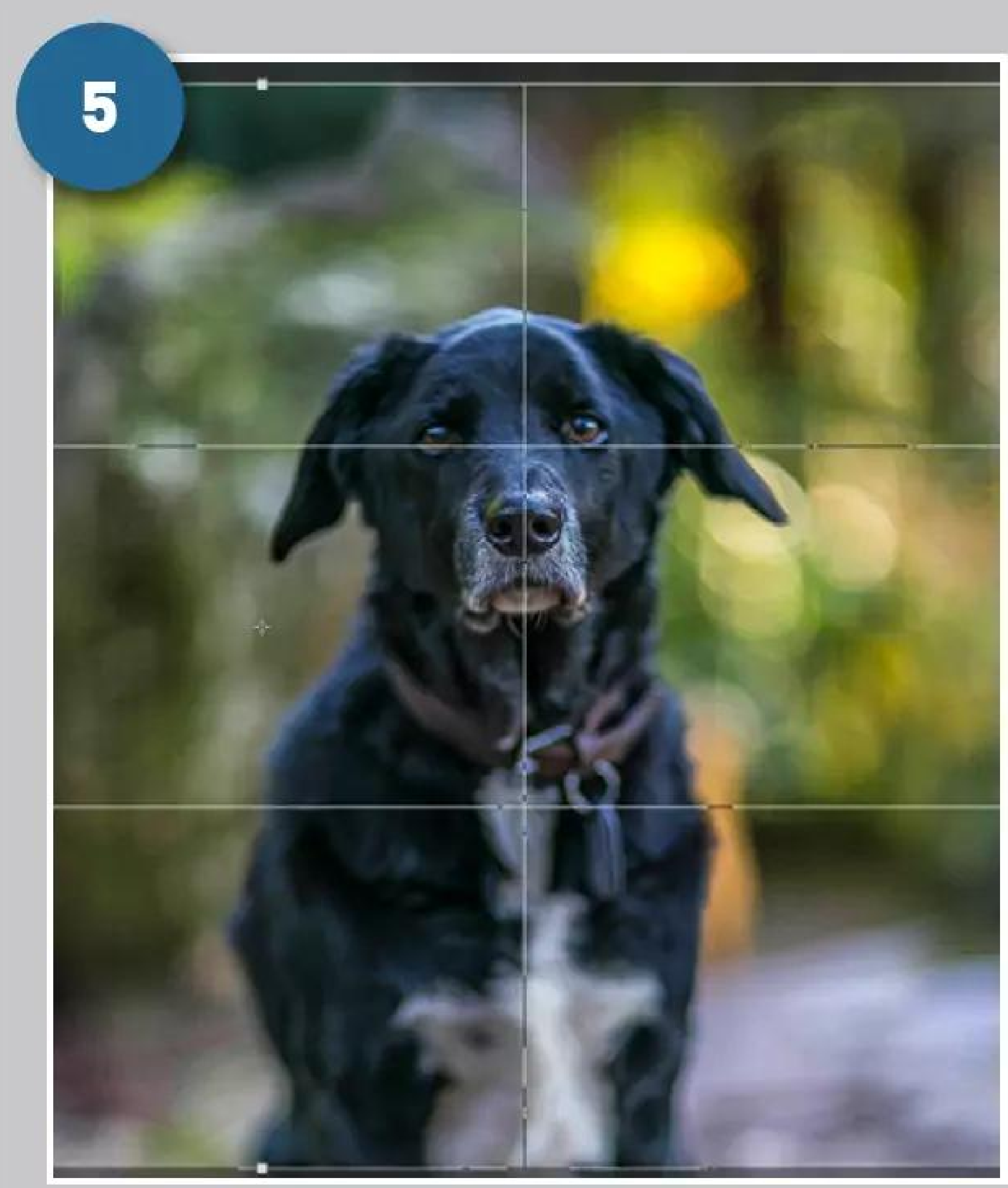

Visual interest

The rule of thirds is a simple guide that can help the composition of your shots and make them much more visually appealing. When framing a shot, you have to imagine that what you can see through the viewfinder of your camera is divided into thirds both vertically and horizontally with lines, just like a noughts and crosses game (or tic-tac-toe if you are in the US). Placing your main subject on an intersection where these lines meet is a simple and quick way to improve composition.

6

Pick a prime

Fast glass is much prized in the world of portraiture. Fast glass has very large apertures, letting in more light and offering faster shutter speeds in low-light conditions. A good portrait lens that has a maximum aperture of f/2.8 - f/1.2 is fantastic at creating the background blur so sought after by photographers. The quality of defocused light this blurring produces is referred to as bokeh. The ability to shoot at f/1.2, for instance, means you can shoot more natural light portraits, without the reliance on strobes.

The holy trinity

ISO, aperture and shutter speed are the three pillars of exposure. The main idea is that altering one of these three settings has an impact on exposure and therefore how your image looks. One or both of the other settings will have to be altered to maintain a balanced exposure. As you develop as a photographer, you will realise that once you are in control, you can create images that look more as you want, rather than what the camera thinks is right when in full auto mode.

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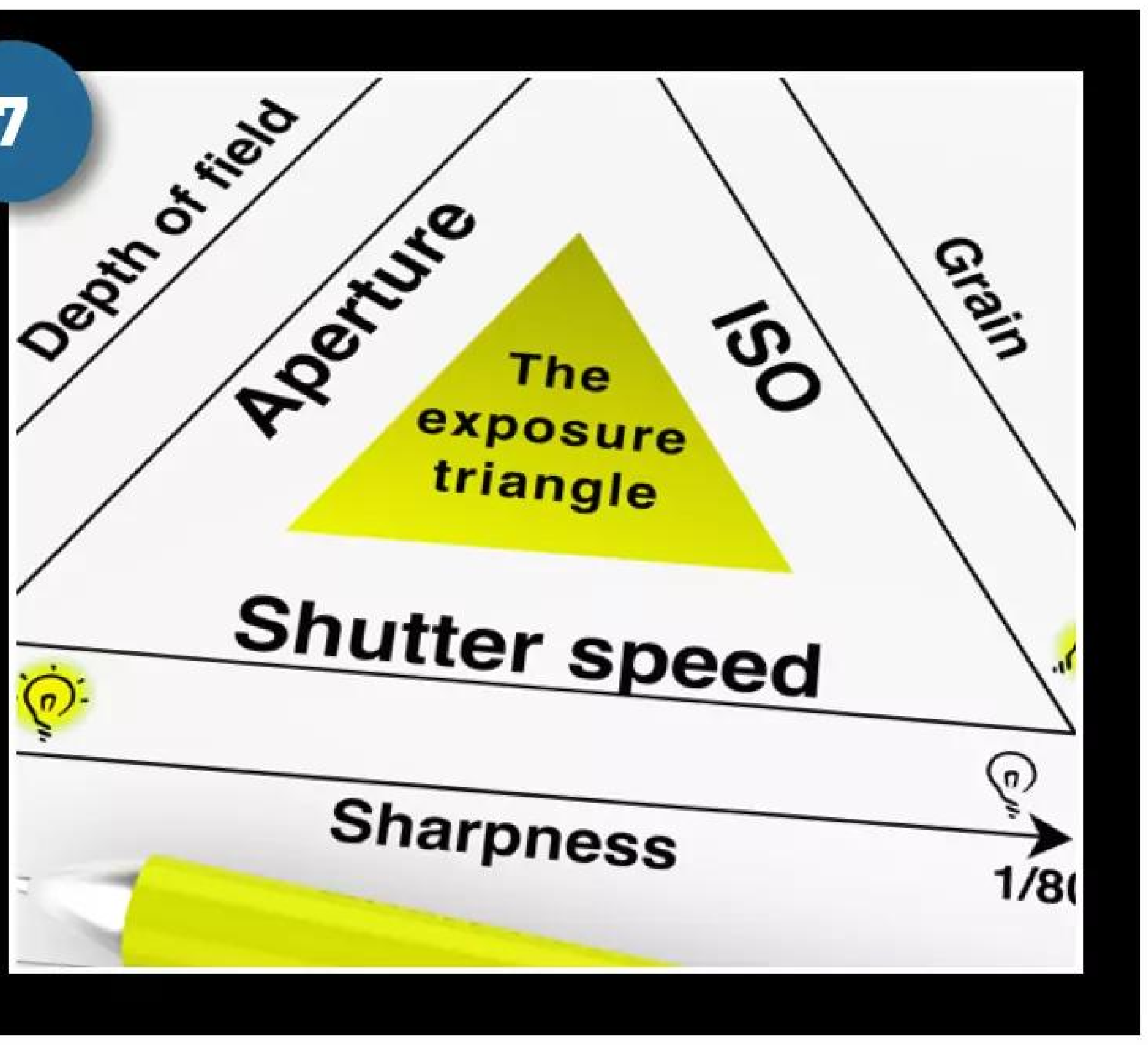

Stop the shakes

Camera shake is the unwanted movement of the camera taking the shot and of the subject of the shot. Modern cameras offer image stabilisation and it can work well up to a point but the lower the light, the more the likelihood is that your shots will be blurry as you need longer shutter speeds to gather enough light for a balanced exposure. If you buy one thing to go with your new camera, make it a tripod. Use a robust tripod and your images will be rock steady in all manner of challenging shooting situations.

8

Depth cueing

A photograph only has two dimensions and any indication of depth in a photograph is purely optical. One of the simplest ways to add depth is to use leading lines like the curve of sand on a beach image or railway lines converging towards the horizon. Another method is atmospheric perspective where mist and fog shroud distant objects making them lighter and with less tonal contrast compared to darker foreground objects.

9

Enhance your photos

If your camera has the option to let you shoot Raw images, use it. A Raw image is the key to much greater post-processing possibilities. Raw images, as the name suggests, are just unprocessed raw data straight from the camera sensor with all the information you need to bring out a beautiful photograph. The act of cropping the shot into a more pleasing aspect ratio can save an image, as can turning it to black and white. The choices are endless, even if it's just contrast, saturation, brightness and sharpness.

10

11

MENU
DISP.
1/50
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AWB
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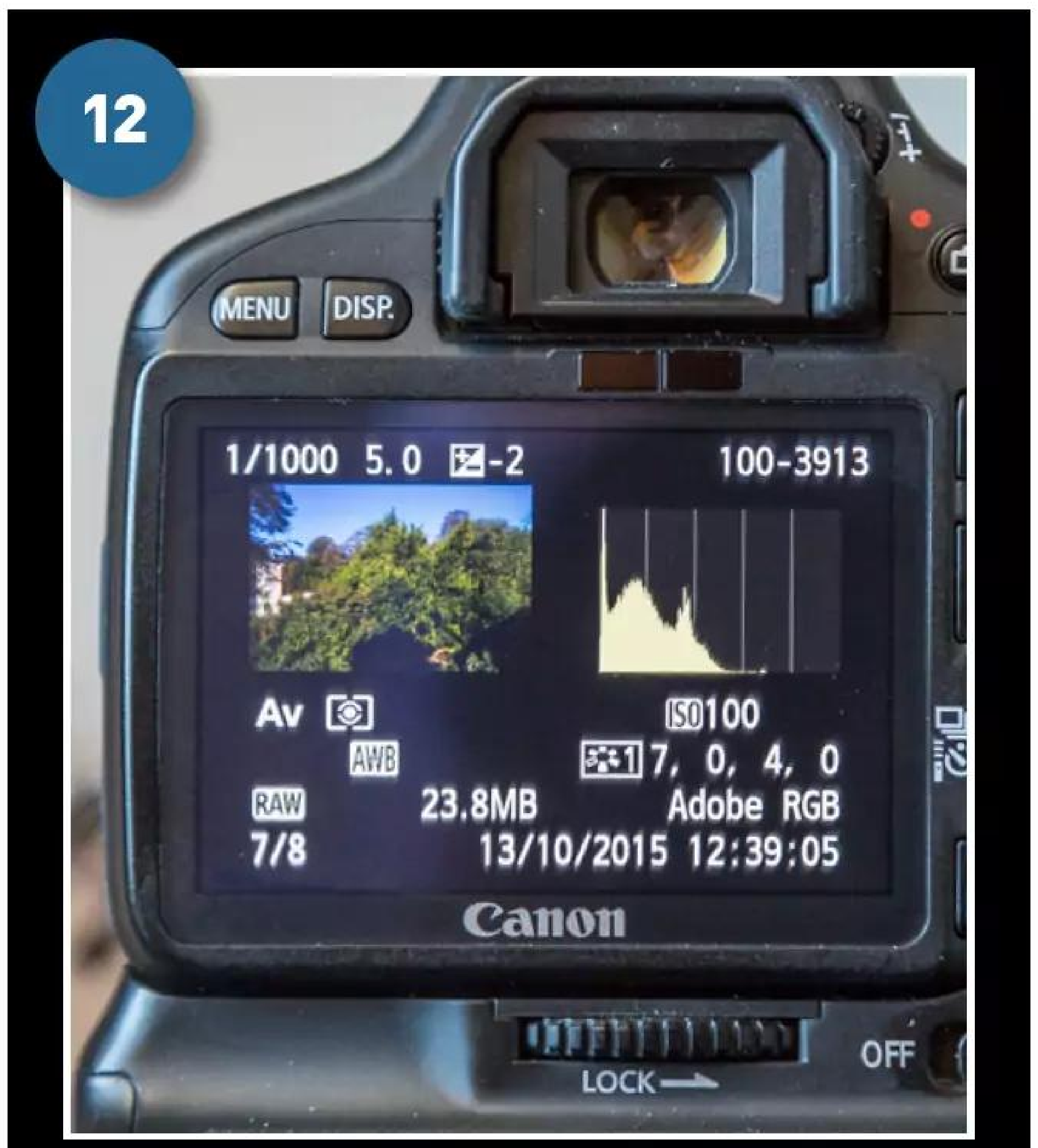
Are you compensating?

As good as cameras are, they will often overexpose and underexpose your photos in challenging lighting situations. That's where exposure compensation comes in. It's a common setting found on digital cameras and it lets you override the camera by making the image lighter or darker based on how much positive or negative exposure compensation you dial in. A lot of cameras will let you preview the result on your LCD screen and once you are happy with how it looks, you can take the shot.

12



Don't fear the histogram

A histogram is a graphic representation of the tonal values in your photograph and how they are distributed. If the graph is bunched at the far left of the display, then your shot is very underexposed and you risk the loss of a lot of detail to shadow areas. If it is sliding off the right hand side, then it will be overexposed and detail will be lost in the highlight areas. A good exposure will have all the major tones in the middle of the histogram.

Learn from others

13

Even the best pros had to pick up a camera for the first time. There are any number of photography forums that you can join and then get advice from other photographers. Why not join a local photography club? It's a great way to meet fellow like-minded photographers of varying skill levels. It's is also a good way of getting motivated to get out and take more photos. You're also more likely to be able to chat with those who are well versed in using software to post-process their images.

14

Further afield

Find a lovely location that you want to photograph and research the area a little, then get yourself out there. Plan to arrive before dawn and get some amazing shots of the golden hour. Explore the area and experiment with composition and camera settings. In fact, just go crazy and enjoy the experience. That's the key to photography. It's there to be enjoyed. Don't worry about making mistakes; keep those shots and review them when you get home and figure out why they didn't work, it's all part of the process.

Out of the shadows

15

While a bright summer day may seem like the perfect time to take photos, at midday every scene will appear flat and featureless with shadows sitting directly beneath every object. The perfect weather for outdoor photography is a bright day with a few white clouds to help diffuse the light and take the edge off the shadows. The perfect time is around sunrise and sunset, with the low sun casting long shadows that will help accentuate the contours of the land.

16

Batteries

Your digital camera can't operate without power, so make sure you fully charge the battery before taking it out for the day. If you're going away for a holiday remember to take your battery charger and an adaptor for foreign mains sockets; and maybe consider investing in a spare battery or external battery pack in case you can't charge it for a while. There are also several devices available that can charge your battery using solar energy or from a hand cranked mini-generator.

A sense of perspective

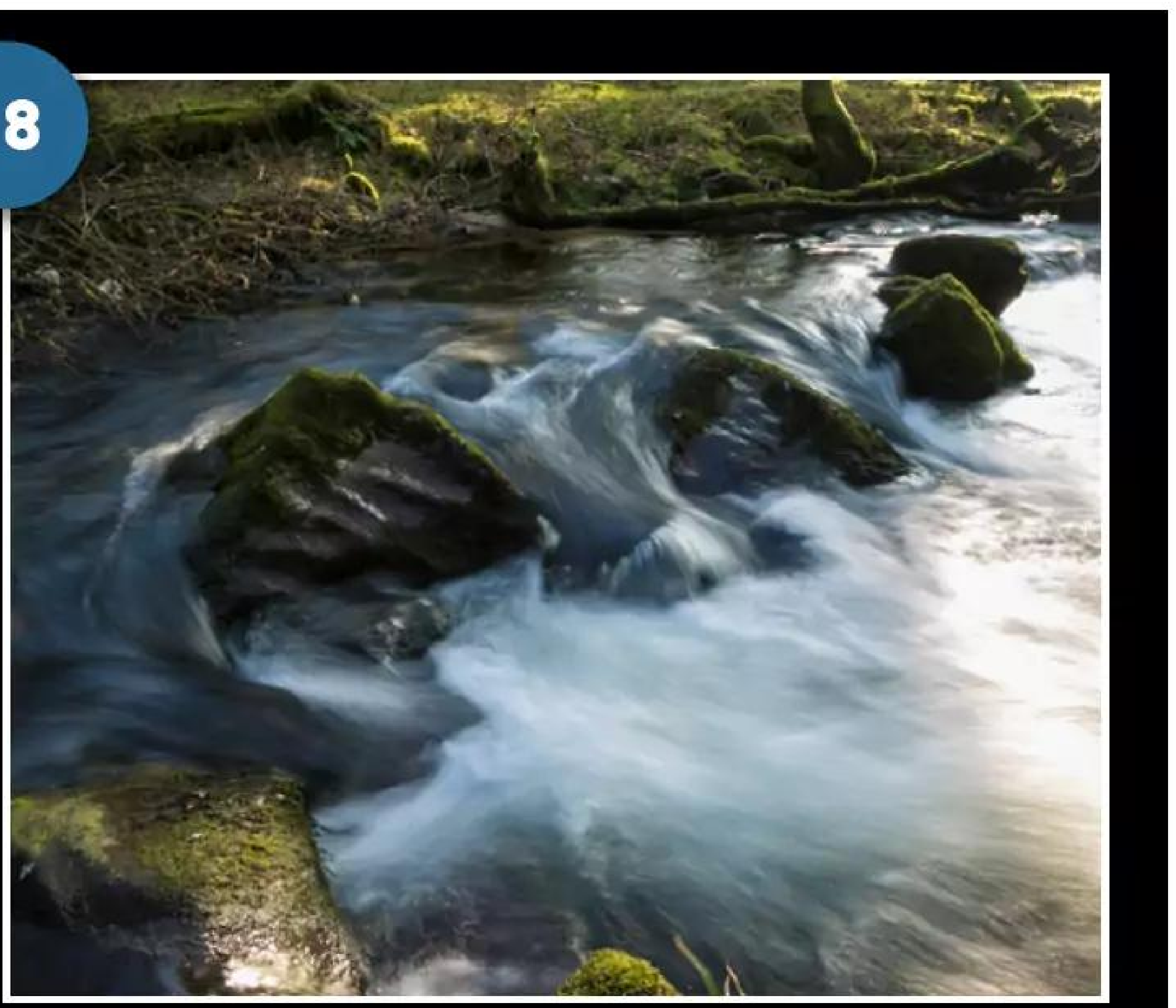
17

An average human, taking a photograph, is viewing the world from their eye level of about 5 feet. Simply changing that viewing angle can radically alter the shot. As a simple rule of thumb, shoot from low down, shoot from high up. Getting above or below your subject alters how you present your subject and how they fit in the world that's around them. You can play with wide angle shots or telephoto shots. You have an amazing amount of choice. Anything to break away from the eye level world that we are used to.

Maximum exposure

18

Consider using longer exposures in your landscape shots. Photographers often employ exposures that last seconds or even tens of seconds, to show clouds streaking across the sky rather than looking static and puffy. Scenes shot with a much longer exposure will turn the water to a misty, milky fog. It is safe to say that your tripod is the key to the success of these shots, as is a good set of ND filters to drive up those exposure times. Filters around the 4 - 8 stop range are perfect.



19

Whatever the weather

Remember that the weather is part of the landscape too. While a nice sunny day is perfect for outdoor photography, natural weather effects such as mist, clouds and even rain can be used to create an attractive photo under the right circumstances. Make the weather part of your composition. Try capturing mist in early morning light, or raindrops hitting puddles or the surface of a lake. Cloud formations can add a lot of interest to the composition of a panoramic landscape shot.

Night photography

You can capture amazing photos of the stars on a clear night by setting your camera on a tripod, setting the aperture to its widest position and using the 'B' exposure setting and a cable release to hold the shutter open for five or six minutes. Make sure you're well away from any light sources such as street lights or passing cars. If you point your camera towards the Pole Star (or the Southern Cross) you'll capture the apparent circular motion of the stars as the Earth rotates.

20

Low-light

When shooting in low light the most important thing to remember is that your camera's exposure meter will try to brighten everything up; this can cause problems with image noise at higher ISO settings. To capture dimly lit subjects against a dark night-time background, try reducing your exposure by a couple of stops. This will also help to reduce the blurring caused by camera shake and moving subjects during long exposures. Use a tripod if you have one.

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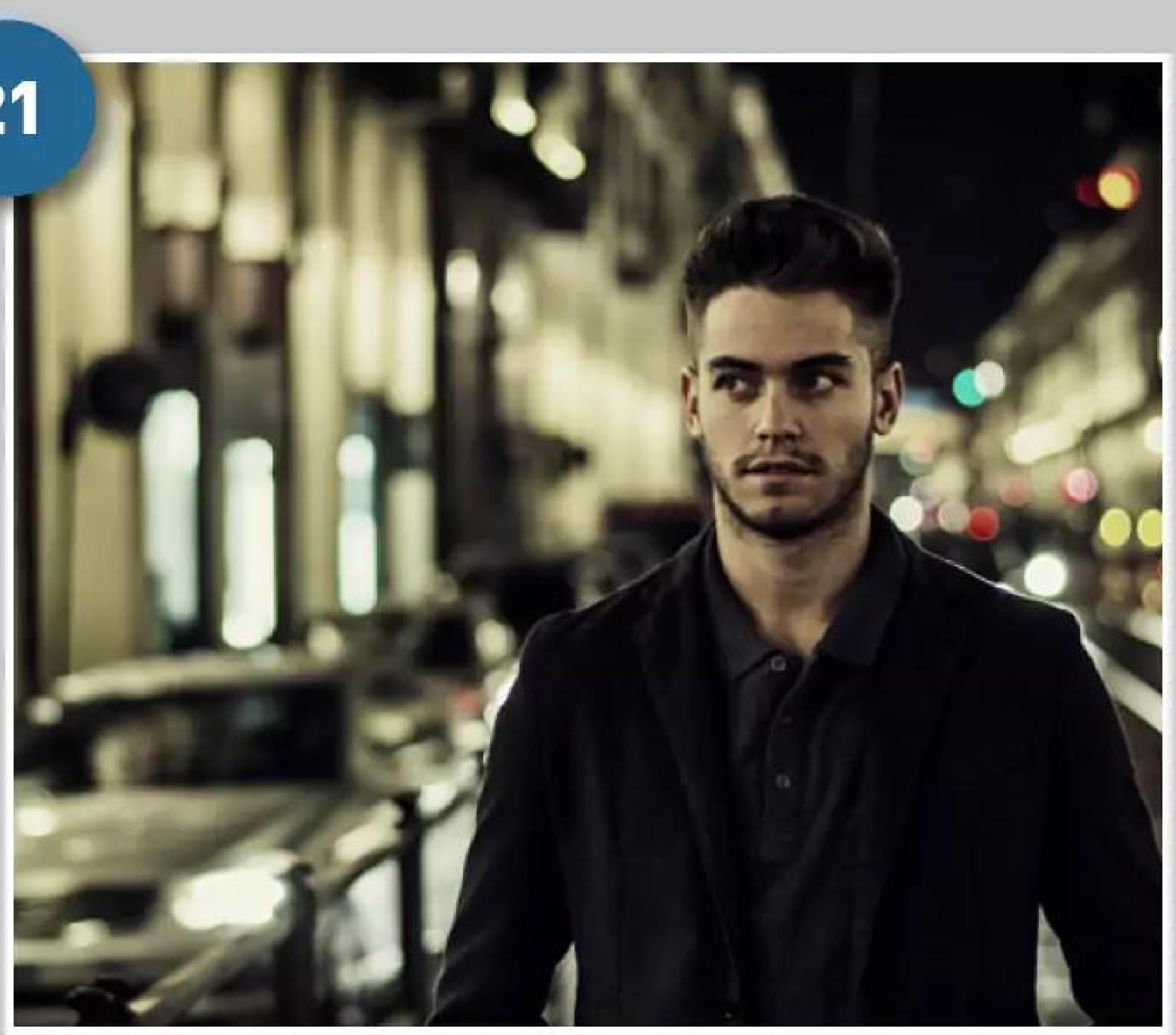

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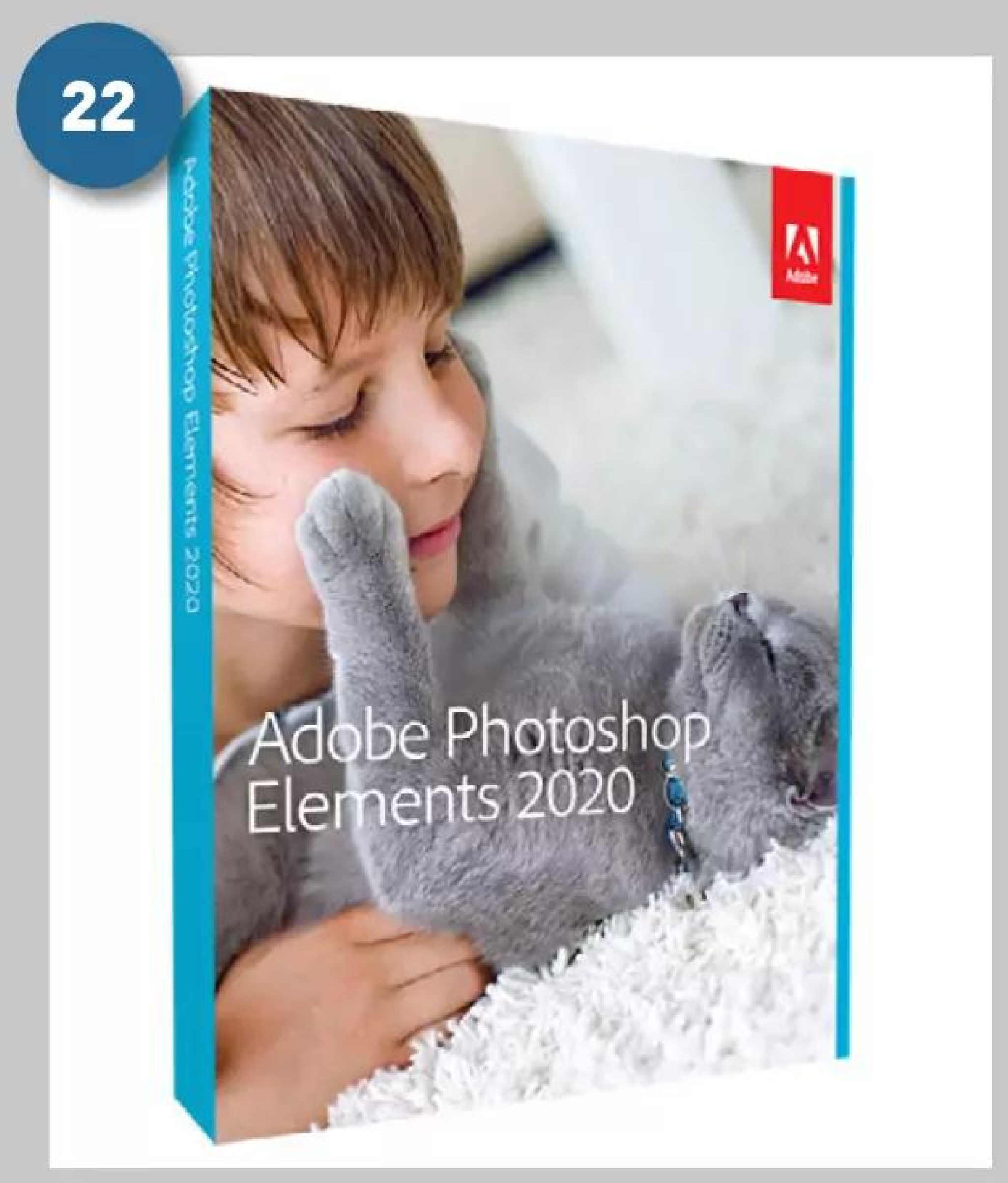

Photo editing software

To get the best out of your photos you'll need photo editing software. You can make simple edits with the Photos app that comes with Windows or with Photos on a Mac but for more accurate and detailed work you'll need something more capable. The best is Adobe Photoshop but with a monthly subscription fee, it may be too expensive for most hobby users. Fortunately, there are plenty of cheaper options, including Adobe Photoshop Elements 2020.

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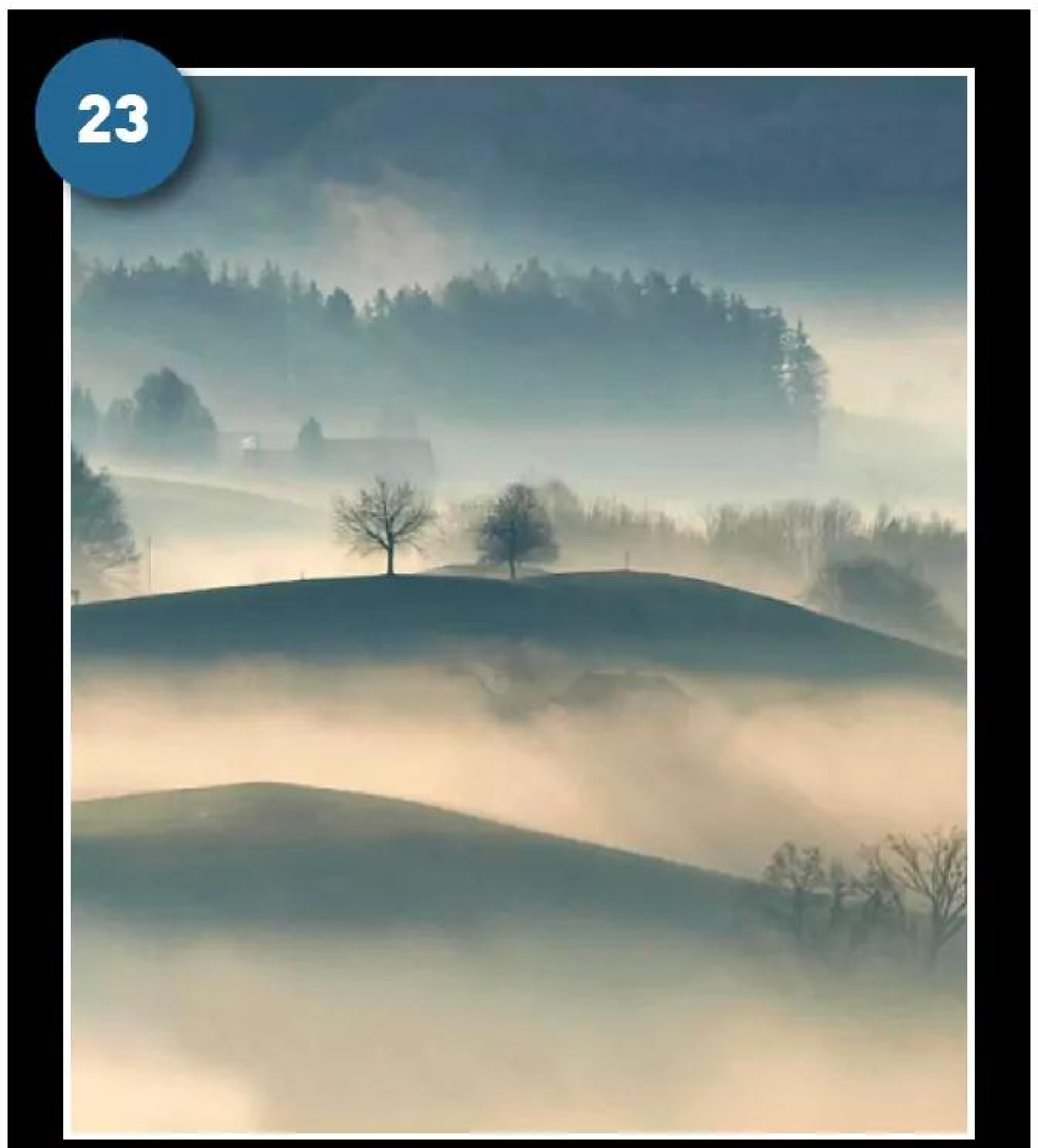

Cold conditions

Cold conditions can cause a few problems for your digital camera, the main one being its effect on batteries. You'll find that even on a cold morning after a clear summer night, your battery will only last around half as long. Make sure that you keep a spare battery in a warm inside pocket and swap them over when the first runs out. When you take your camera back indoors, keep it in a sealed plastic bag until it has warmed up. This can really help to avoid condensation problems.

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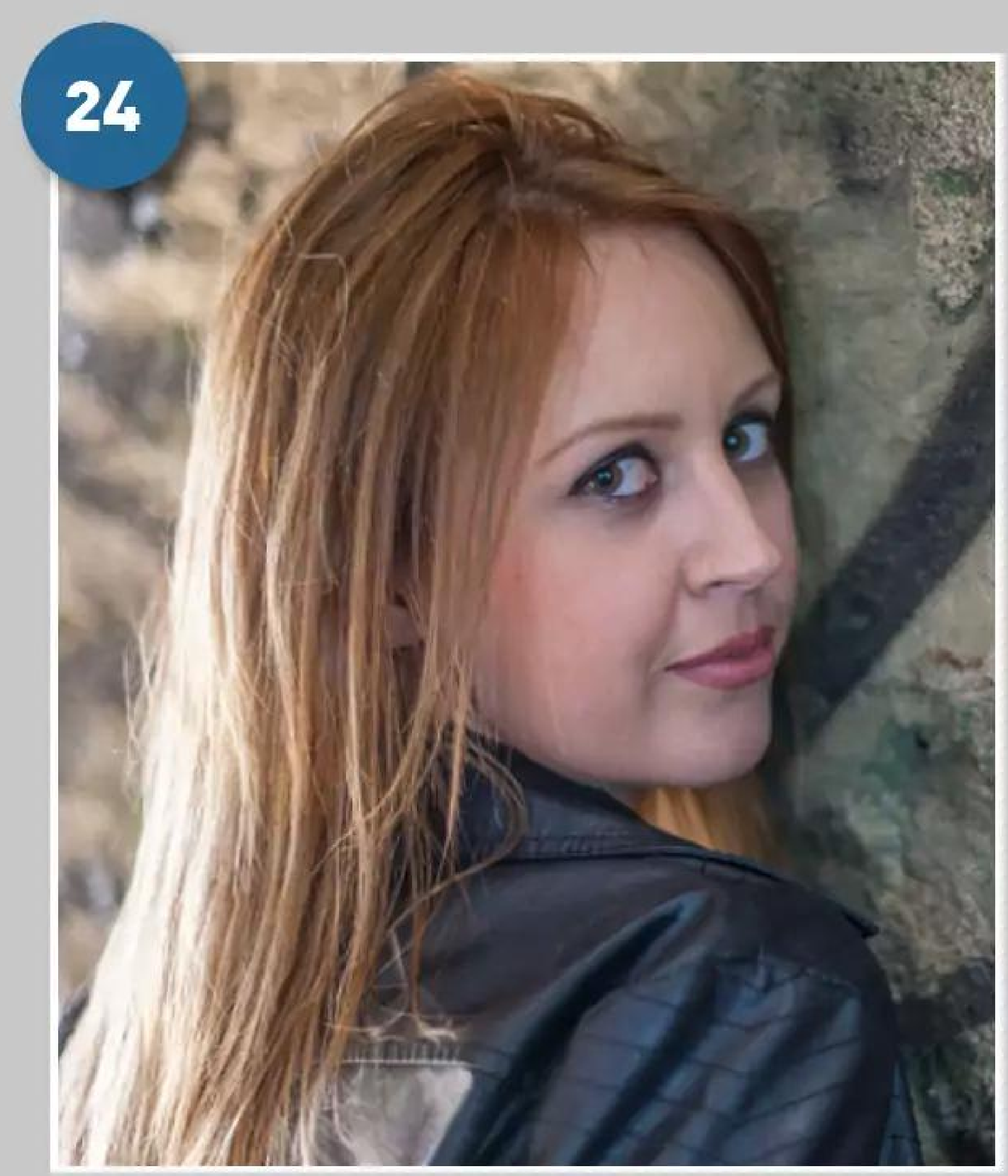

Natural light portrait

Have you thought about shooting your portraits outdoors to take advantage of natural light? Try positioning your subject so that their face is well-lit but don't believe the old tip about having the "sun over your shoulder". You should avoid having them face directly into the sun, because this will cause them to squint. The best option is to have them stand in bright shade, or near a white wall or other light coloured object that will reflect a flattering diffused light.

Leading lines

There are many rules and guidelines for photographic composition but one that applies most often to landscape photography is the concept of leading lines. When composing your shot, try to find lines in the scene, such as roads, rivers, railway lines or hedges. Frame your shot so that these lines will lead the viewer's eye into and through the scene. They will also help to give the scene a sense of scale and perspective and this will also help with your composition. It doesn't matter if they are straight or curved.

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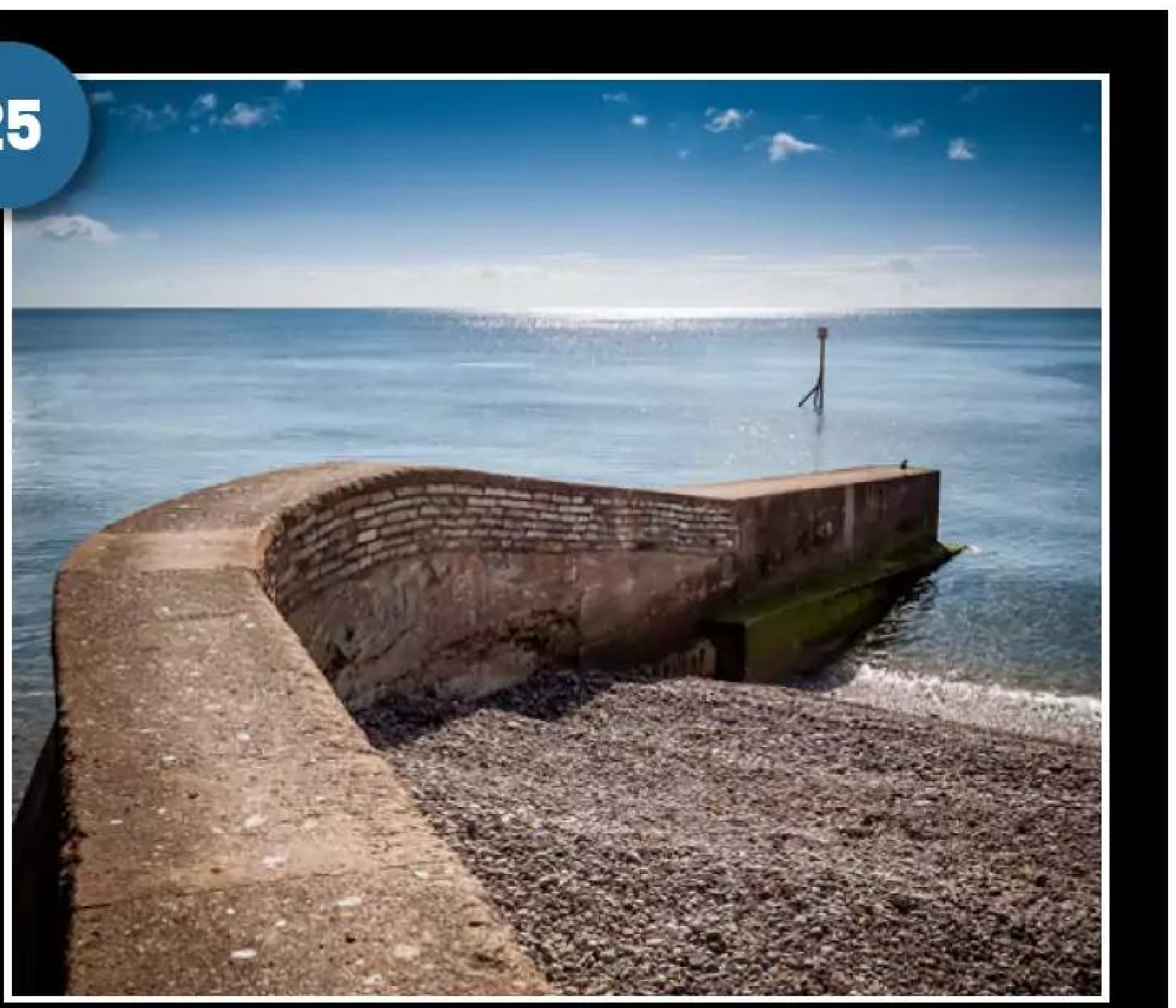

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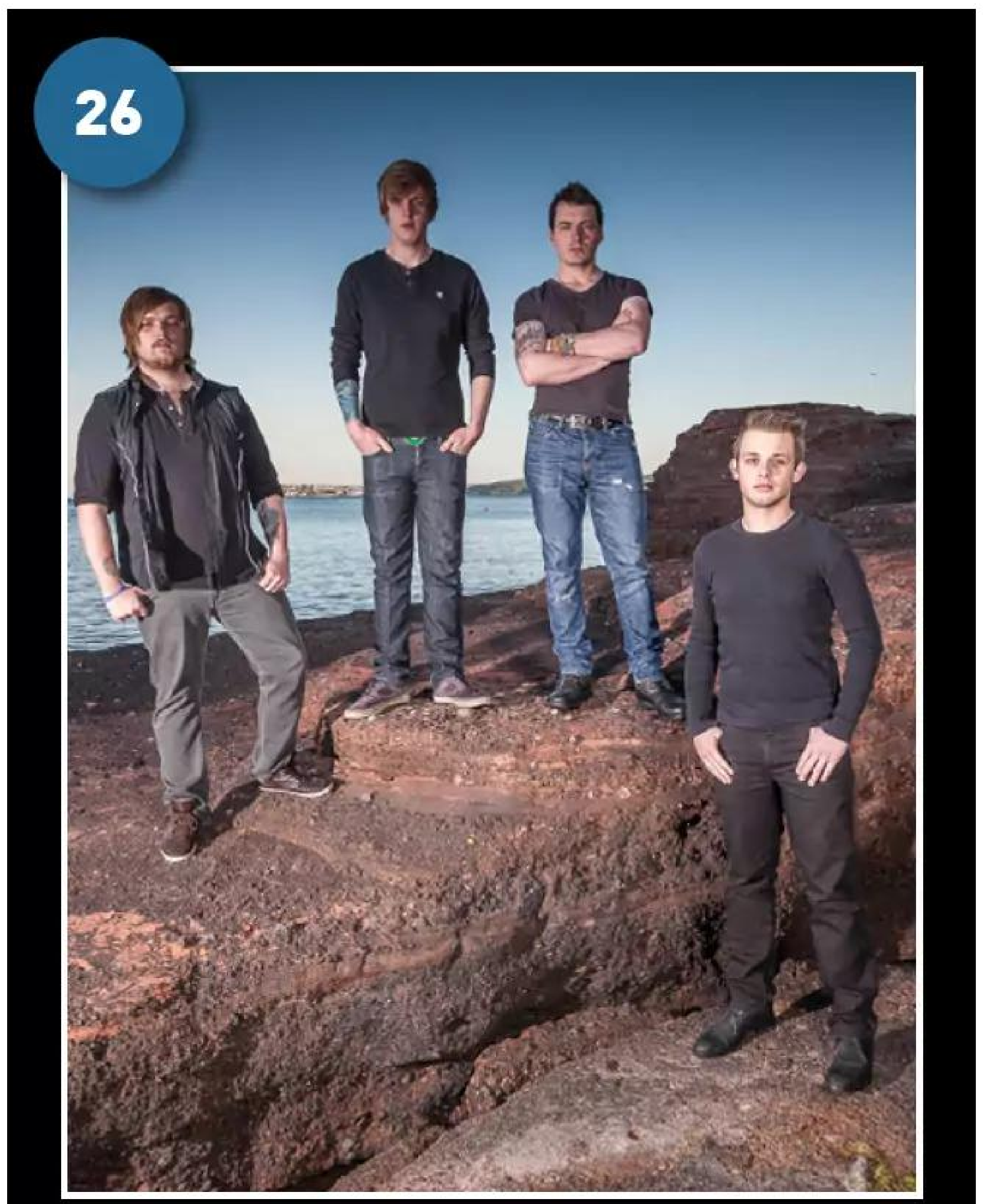

Group portraits

If you're shooting a group portrait, try to find a location that lets you position your subjects at different heights. A set of broad steps, a low wall, a park bench or even the trunk of a fallen tree make ideal impromptu stages, and add interest to what would otherwise be a fairly dull photo. Position shorter people at the front of the group or get those at the front to kneel, so that everyone can be seen clearly in the shot.

Depth of field

Depth of field is the distance between the nearest and most distant objects in a scene that are in focus and acceptably sharp. It is controlled by a combination of aperture and focal length and is an important creative tool for improving your photographs. Use a shallow depth of field (with a wide aperture) to isolate subjects against a blurred background, or use a large depth of field (narrow aperture) to capture an entire scene in sharp detail. Portrait photographers love shallow depth of field.

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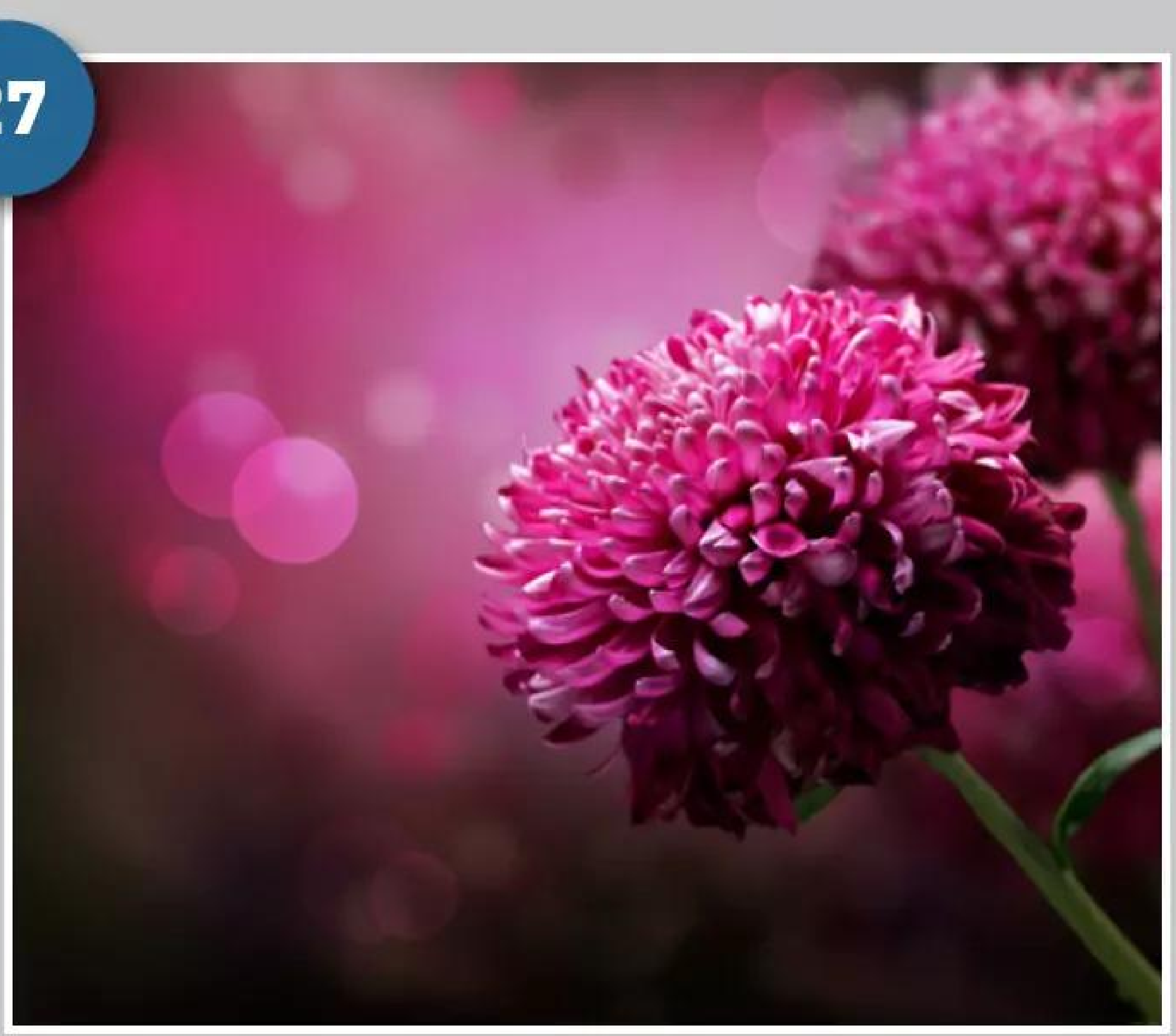

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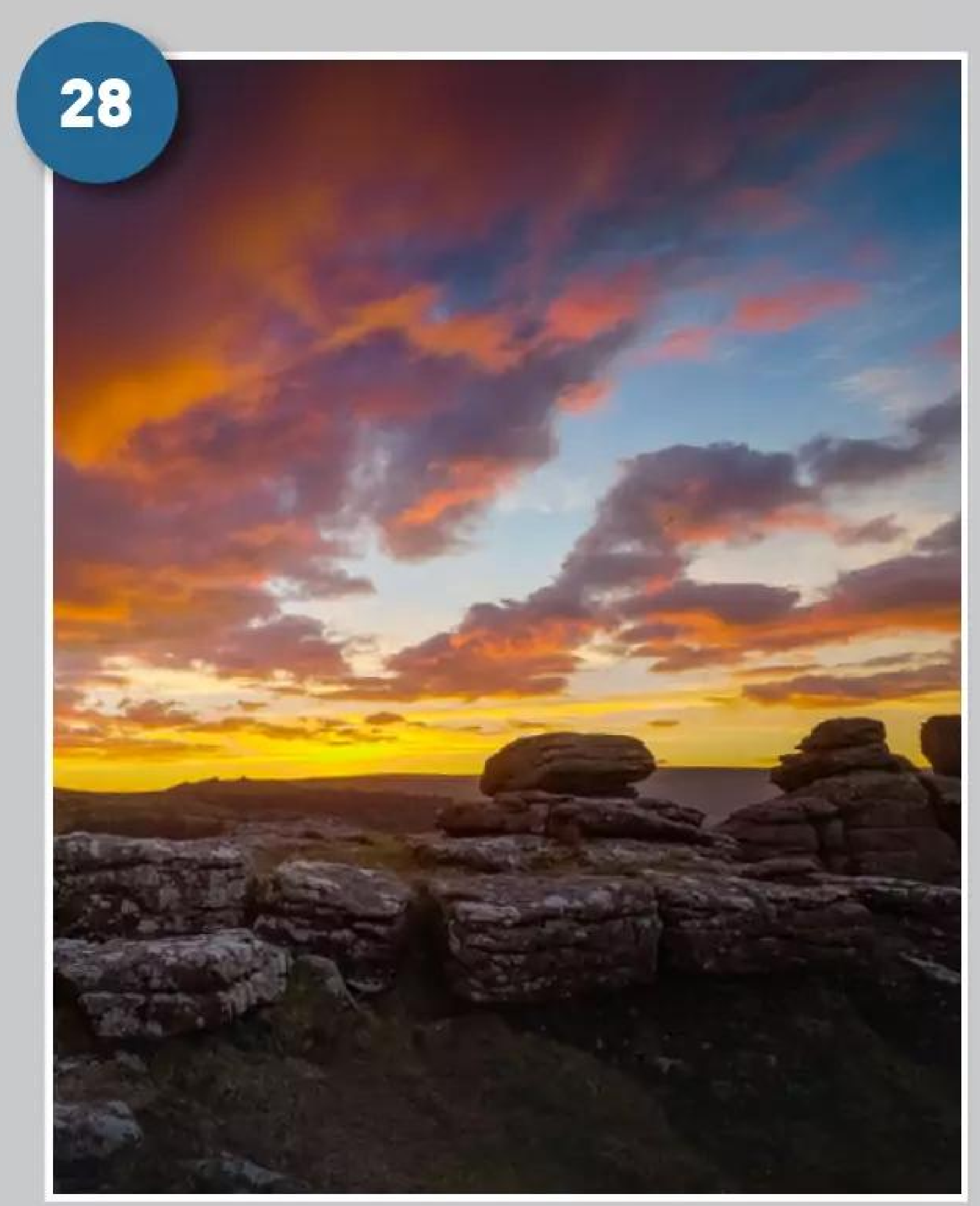

Time of day

When shooting landscape shots, the time of day is all-important. You can't control the position of the sun in the sky, so you'll have to wait for it to be in the right position to provide the best lighting for your scene. Make a note of sunset and sunrise times and try to visit the same location several times at different times of day. The favourite times for perfect lighting are an hour after sunrise and an hour before sunset, known as the 'golden hour'.

Position

Since you can't move the landscape around to suit your composition, choosing the right position to take your shot is all-important. Study the scene you want to capture and try to picture how it would look from higher up, lower down or from a different angle. Be aware of obstructions such as power lines and pylons, and try to choose a location that minimises their impact. The perfect location may involve a bit of hiking but it will be worth it. Don't stay rooted to one spot; be prepared to move around a lot.

29

Harmony and balance

There's more to a good landscape composition than just a snapshot of some nice hills. Try to include foreground detail such as old walls, rock formations or plants. They will add depth and a sense of perspective and scale to your picture, and make for a much more interesting composition. Try to balance foreground detail with background detail to create a harmonious balance to your composition. Using the rule of thirds will help you greatly.

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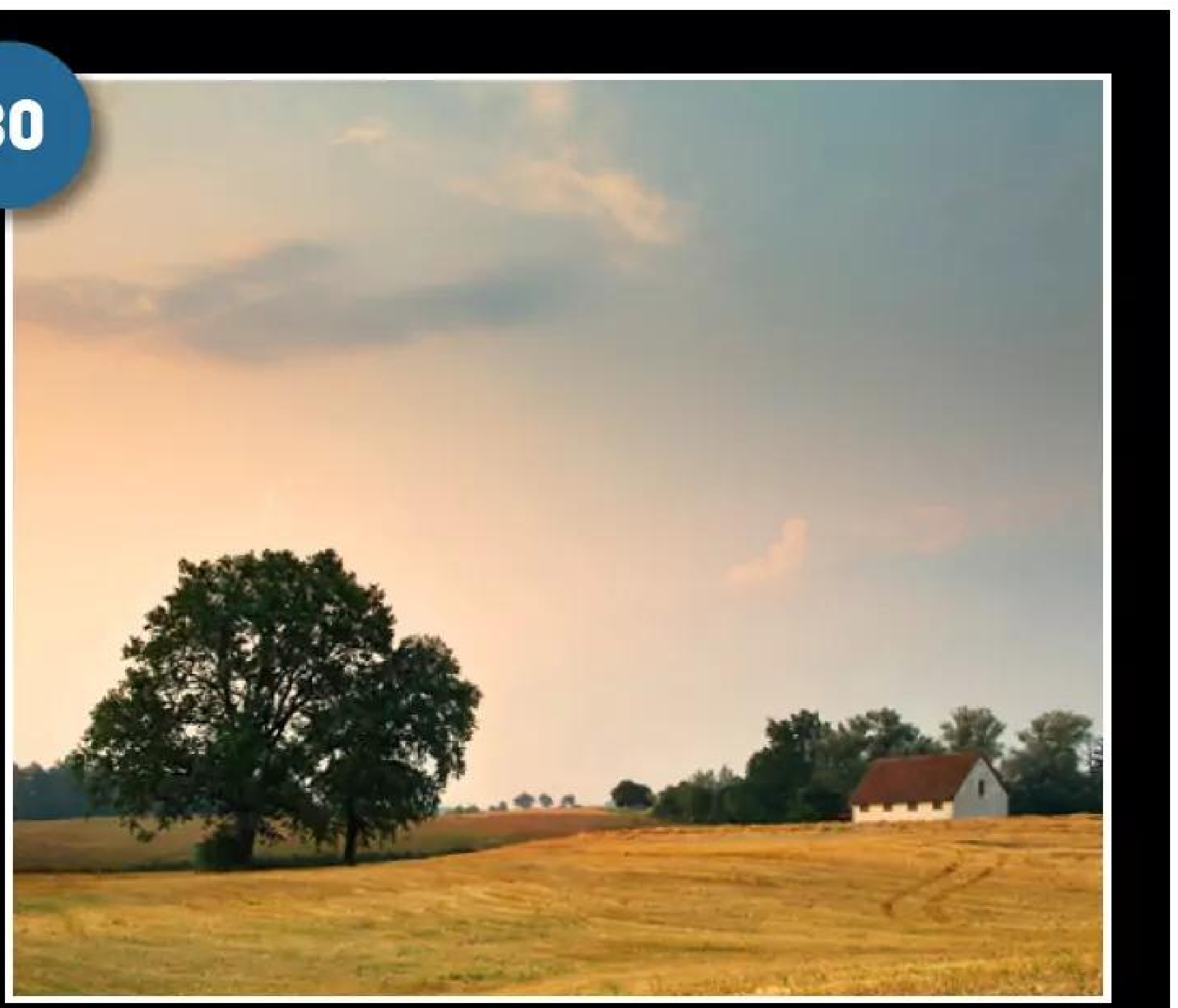

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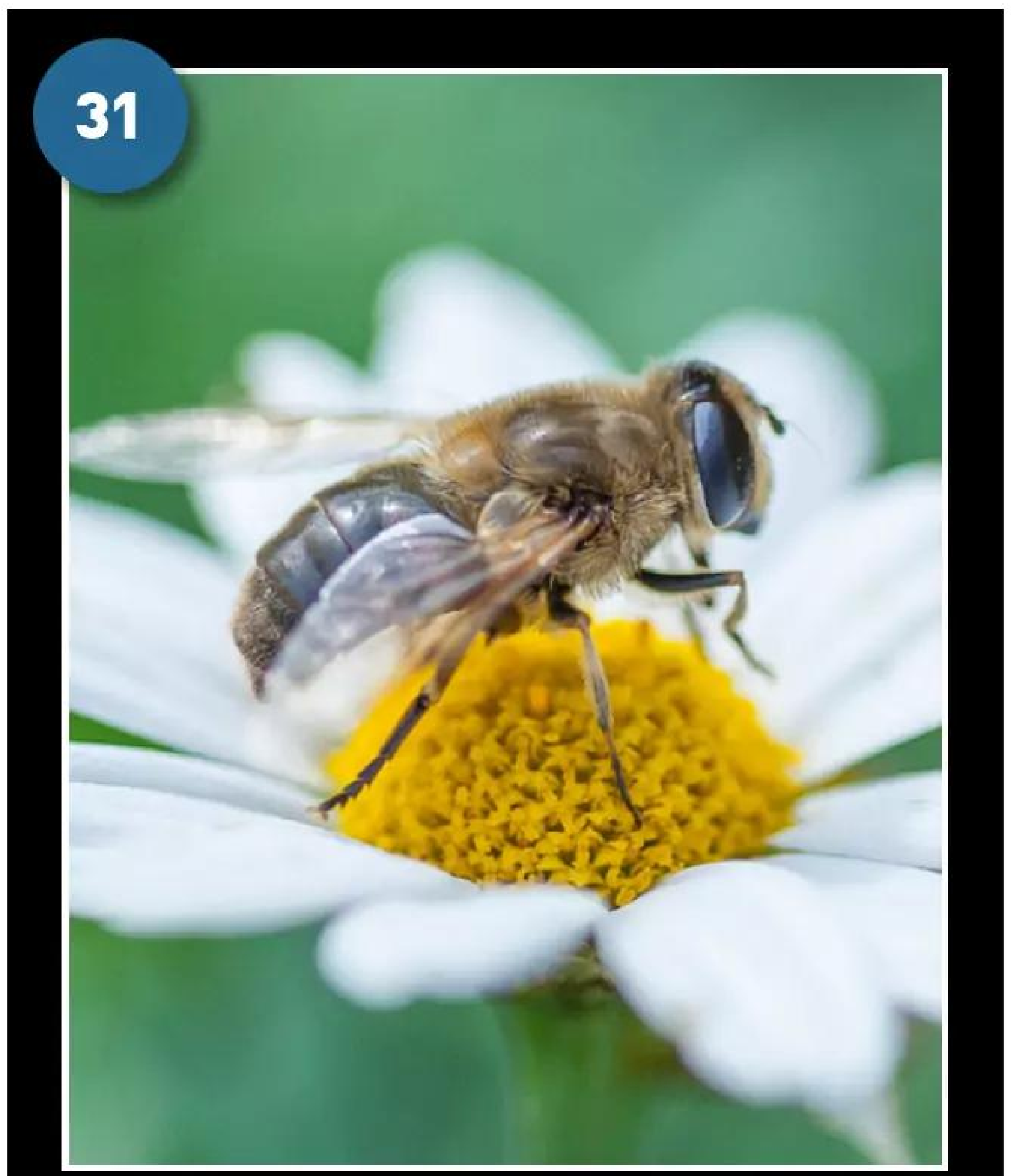

Close-up

Good close-up photography requires either a camera with a very close minimum focusing distance or a special macro lens. The main problem with extreme macro photography is that the object you're focusing on will be in the shadow of your camera, so try to arrange lighting from the side. One handy gadget to try if you plan to do a lot of close-up work is a ring flash, which provides even illumination from all sides.

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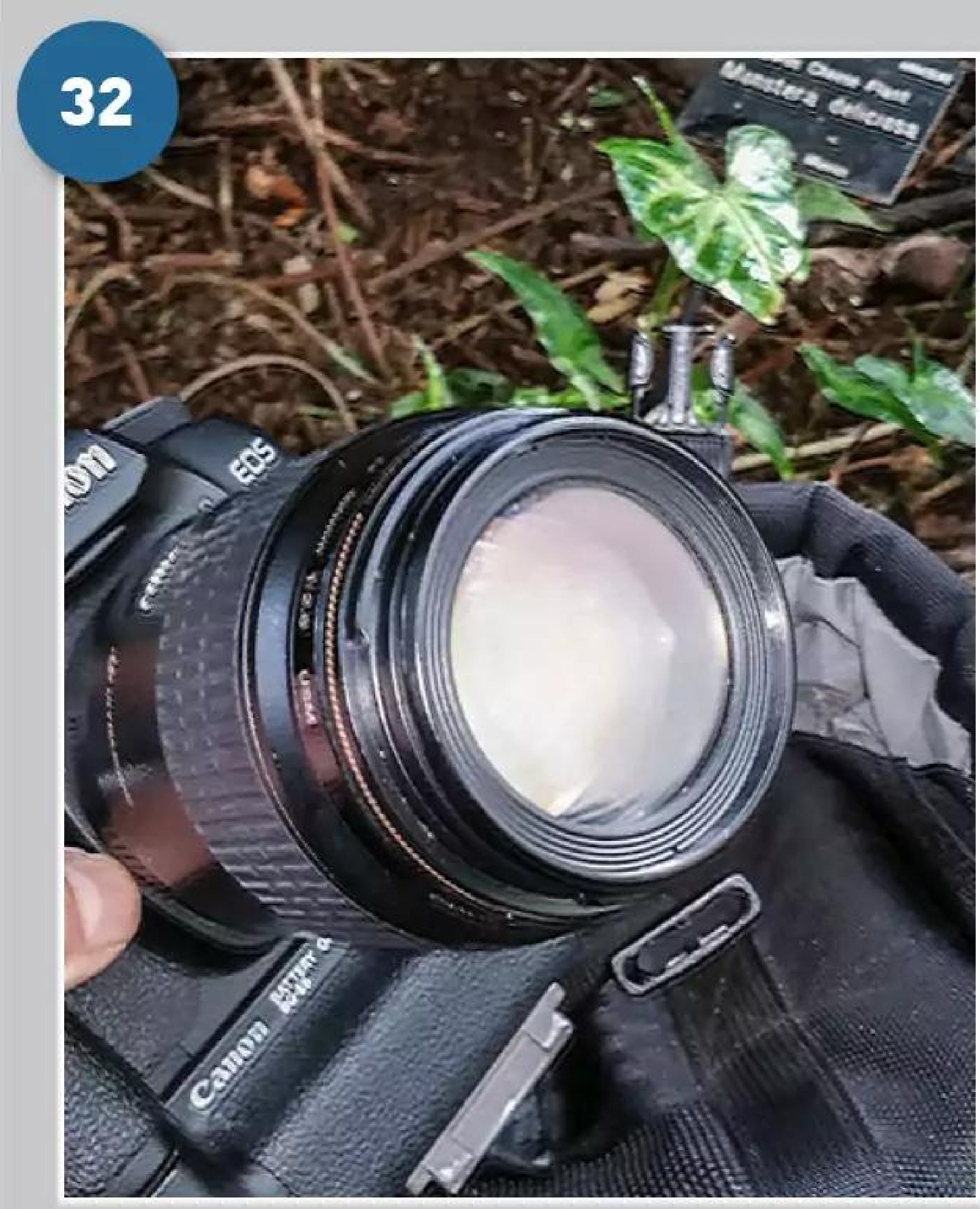

Hot weather

Hot weather can also cause some problems, with condensation and high humidity being at the top of the list. Keep a couple of bags of silica gel in your camera bag to absorb any stray moisture and wipe off any surface condensation as soon as it forms, to avoid it seeping inside your camera and messing up the electronics. Keep your lens clean too and avoid the problem of fungal blooms growing inside the lens barrel.

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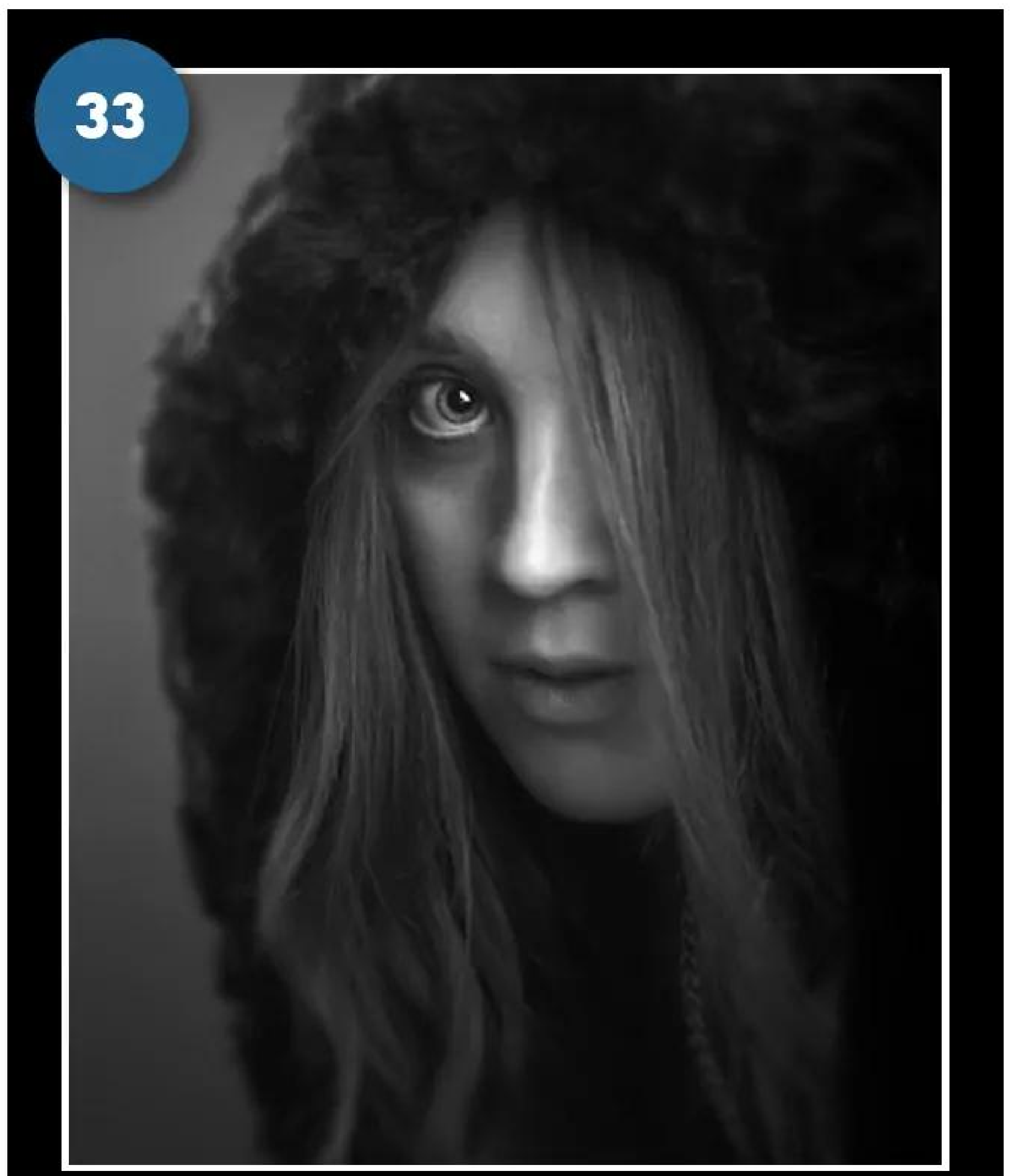
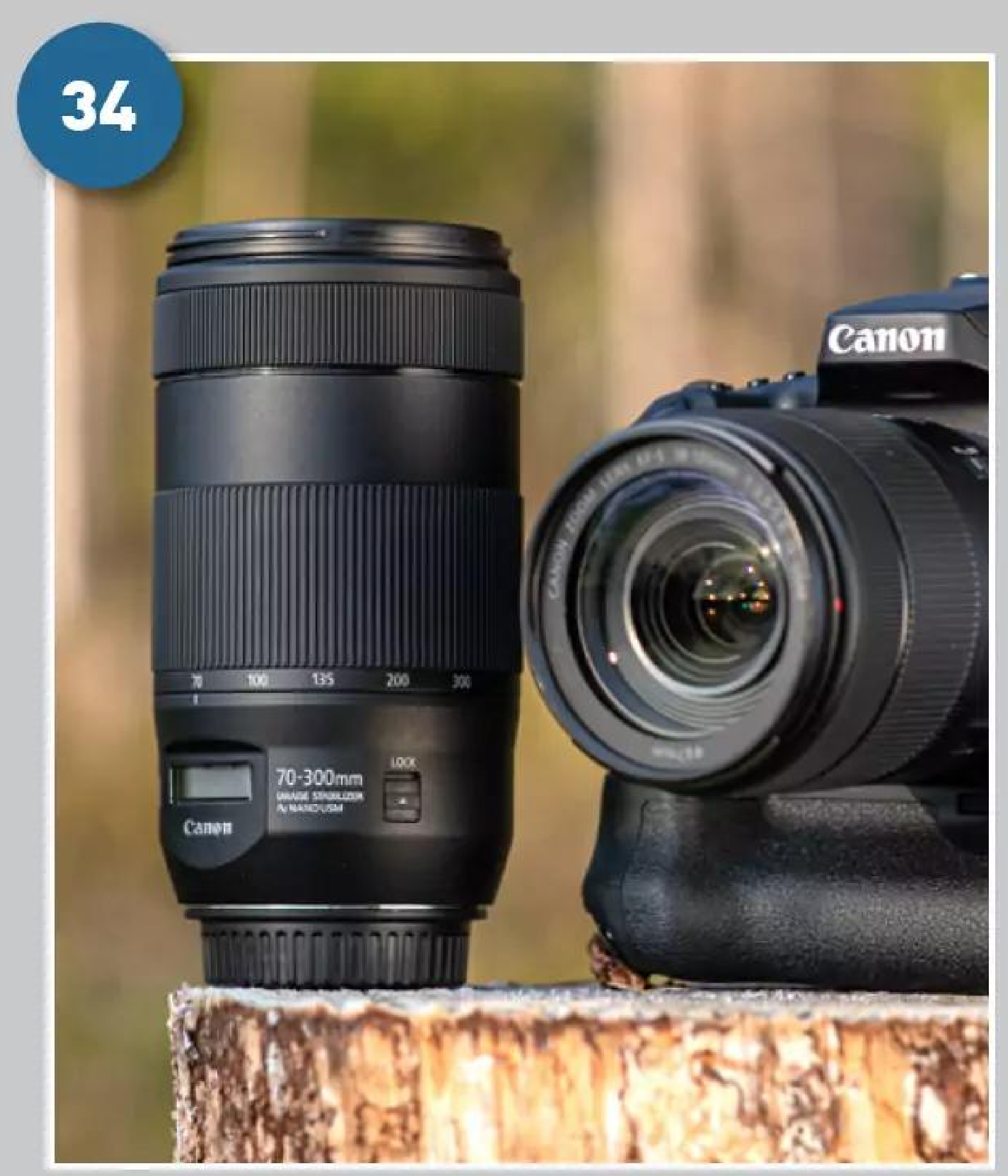


Black and white

There are many subjects that can look great in black and white, particularly portraits, rough textures like old stone, and even landscape shots. However the black and white mode on your camera may not do the scene justice. You can get much more creative control over the final appearance of the image by converting the photo to monochrome using photo editing software. This is especially true if you shoot in Raw mode, with its much greater tonal range.

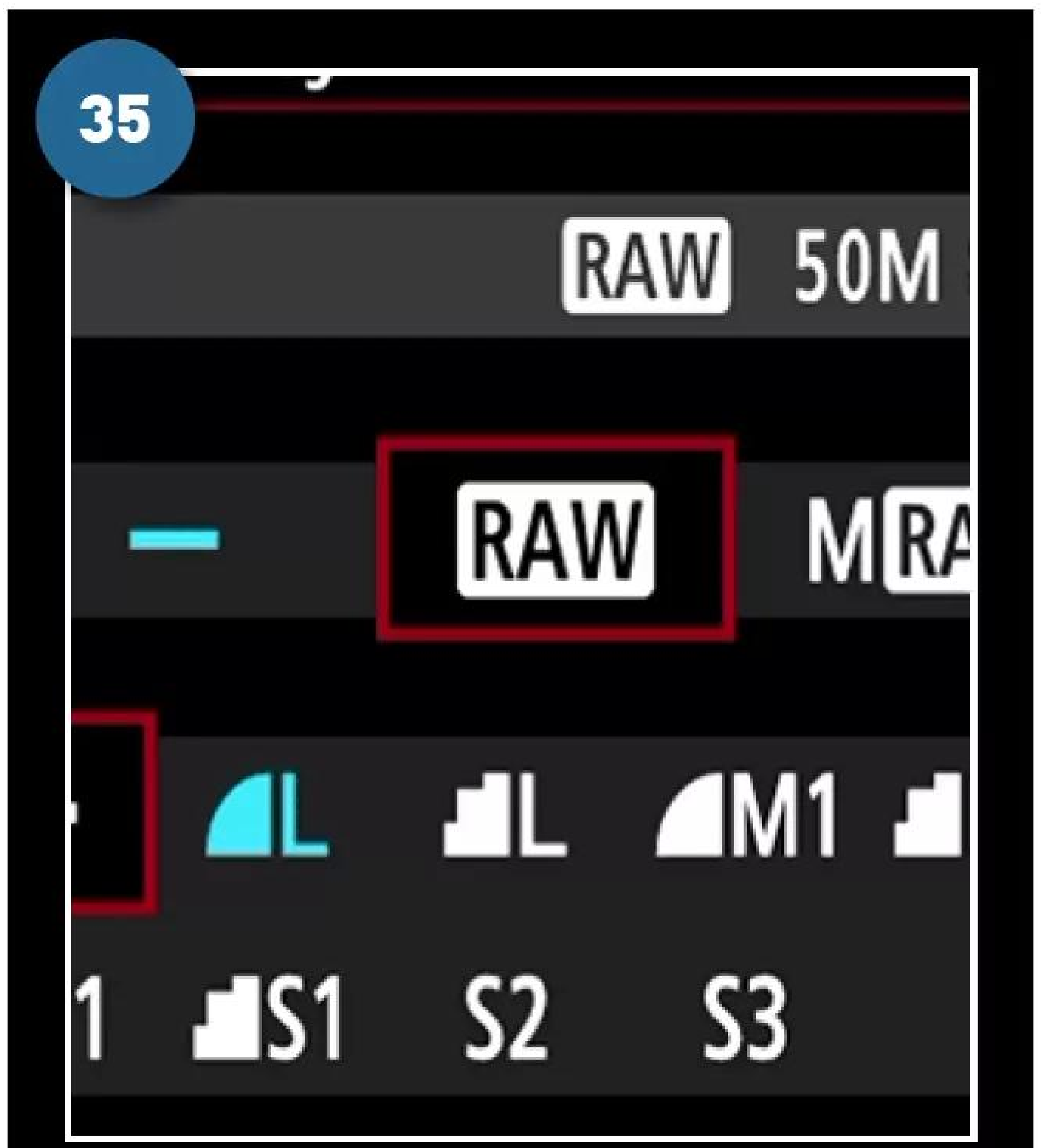
34



Focal length

Focal length, or the zoom setting of your lens, is one of your most important creative tools. Longer focal lengths let you get closer to distant subjects, whilst wide angle settings let you capture more of your surroundings. However, most people only ever seem to use the minimum and maximum settings. If you do this you're missing out on a lot of creative potential. Use focal length creatively to improve composition or to focus attention on details in a scene.

35



Raw mode

Most high-end cameras, and even some of the better mobile phone cameras, have a feature called Raw mode. This is the equivalent of the negative in a film camera; you can take the Raw image data and process it yourself using image editing software such as Photoshop. The advantage is that the Raw mode file contains uncompressed data with more colour information and tonal depth than the processed JPEG image that your camera usually produces, so you can do more with it.

36

Get on their level

Children, as you may have noticed, are usually considerably shorter than adults, so all too often when photographing them they're either looking awkwardly upwards into the camera or you can only see the tops of their heads. When photographing young children, try kneeling or sitting down, so that you're more or less on their level. You'll appear less intimidating and your picture will capture the world from the child's point of view.

CREATIVE PHOTOGRAPHY

Learn the techniques that the professionals use

Now you're familiar with how your camera works and how to use its many features, you're ready to start learning the creative techniques that professional photographers use to achieve great results time after time. By learning and using a few simple techniques you can turn your photographs from well taken snapshots into works of art of which you can be proud.

Professional photographers use some very simple tricks and rules-of-thumb that have been developed over many years, including rules of composition that are inspired by classical art. Combined with technical skill and a thorough understanding of the principles of photography that we laid out in the previous section, these artistic methods produce well balanced, attractive photographs that will really stand out. However the true artistic inspiration that differentiates a talented photographer from merely a skilled technician must come from within, and can't be taught by any guidebook, so we hope you will step out and make your mark.

There are of course many more secrets and tricks in the field of creative photography than we have room to cover in this general guide to photography, but hopefully we can show you some basic principles that will form the foundation of your hobby and inspire you to learn more. If we succeed in that aim, then our job here is done! ■

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Canon
CANON ZOOM LENS 5x IS
8.8-44.0mm 1:1.8-2.8
G5X

Capturing the dawn

Early morning light makes for a beautiful sunrise

Photographers have a phrase, the "golden hour", which refers to the first and last hours of light in the day, but particularly the special light one only sees at dawn. To capture a shot like the one on this page requires not only precise control of exposure, but also the dedication and patience to wake up while it's still dark and get set up to take the photo before the sun rises. Since that beautiful morning mist depends on the weather conditions, you might have to try several mornings in a row to get a shot this good. You have to be really committed to your art to go above and beyond!

As for the technical aspects of the shot, the photographer has used a medium wide focal length of approximately 24mm, and a small aperture to keep a large portion of the scene in focus. The fog itself provides the main challenge. By careful use of metering the photographer has captured the soft colours and diffused light of the very foggy morning, giving the picture an ethereal and other-worldly look. ■

> "That beautiful morning mist depends on the weather conditions, you might have to try several mornings in a row to get a shot this good."

A great all-rounder

24-105mm
IMAGE STABILIZER
ULTRASONIC
Canon
24 35 50 70 85 105
AF MF

The Canon EF 24-105 f/4 L II USM series wide-angle zoom lens; a great general-purpose lens with a decent wide-angle to telephoto zoom range and impressive image stabilisation for shooting in low light situations, such as the early dawn and dim interiors.

Mastering exposure metering allows you to cope with almost any lighting conditions, and opens up a whole world of creative possibilities. A beautiful shot like this is only possible with very precise metering and exposure.

Shallow depth of field

Isolate your subject using narrow depth of field

Careful control of depth of field by adjusting aperture and focal length is one of the most striking creative techniques available to the photographer, and you don't need any special equipment to do it, just your camera and a zoom lens.

For this insect image, the photographer has used a 100mm, fast macro lens with a large maximum aperture of f2.8. This has resulted in a narrow depth of field, but by carefully focusing on the creature's body the effect of this narrow plane of focus is to isolate the insect against what could otherwise be a distracting background of the green leaves and grass both behind, and in front of, the subject.

One consideration to bear in mind is that when working with very shallow depth of field, precise focusing is essential. The slightest movement and your subject will shift out of focus, so a good tripod is recommended to eliminate those shot-spoiling effects. ■

> "Large focal length lenses will demand higher shutter speeds and a good tripod."

Be a macro master

CANON MACRO LENS EF 100mm 1:2.8 L IS USM
Canon
MACRO 100mm
IMAGE STABILIZER
ULTRASONIC
0.5m—∞
FULL
0.3m—
0.5m

The Canon EF 100mm f/2.8 L series macro lens. Perfect for macro shots at 100% magnification, with the added bonus of image stabilisation for more opportunities to shoot handheld. You can shoot as close as 30cm and the f/2.8 aperture enables you to create beautiful background blur in your shots.

If the background of your photo is distracting, you can blur it out by using a wider aperture to create a narrow depth of field.

"It's important to choose the right lens for the job, but top quality DSLR lenses are very expensive."

The fisheye lens

The right lens for the job

Digital SLR systems offer the greatest versatility of any photographic system, and represent the best compromise between quality and portability. The best CSC systems are still some way behind, but are catching up fast.

There are lenses and other accessories available to suit every type of photography, both amateur and professional. It is worth being aware that top quality DSLR lenses command top prices.

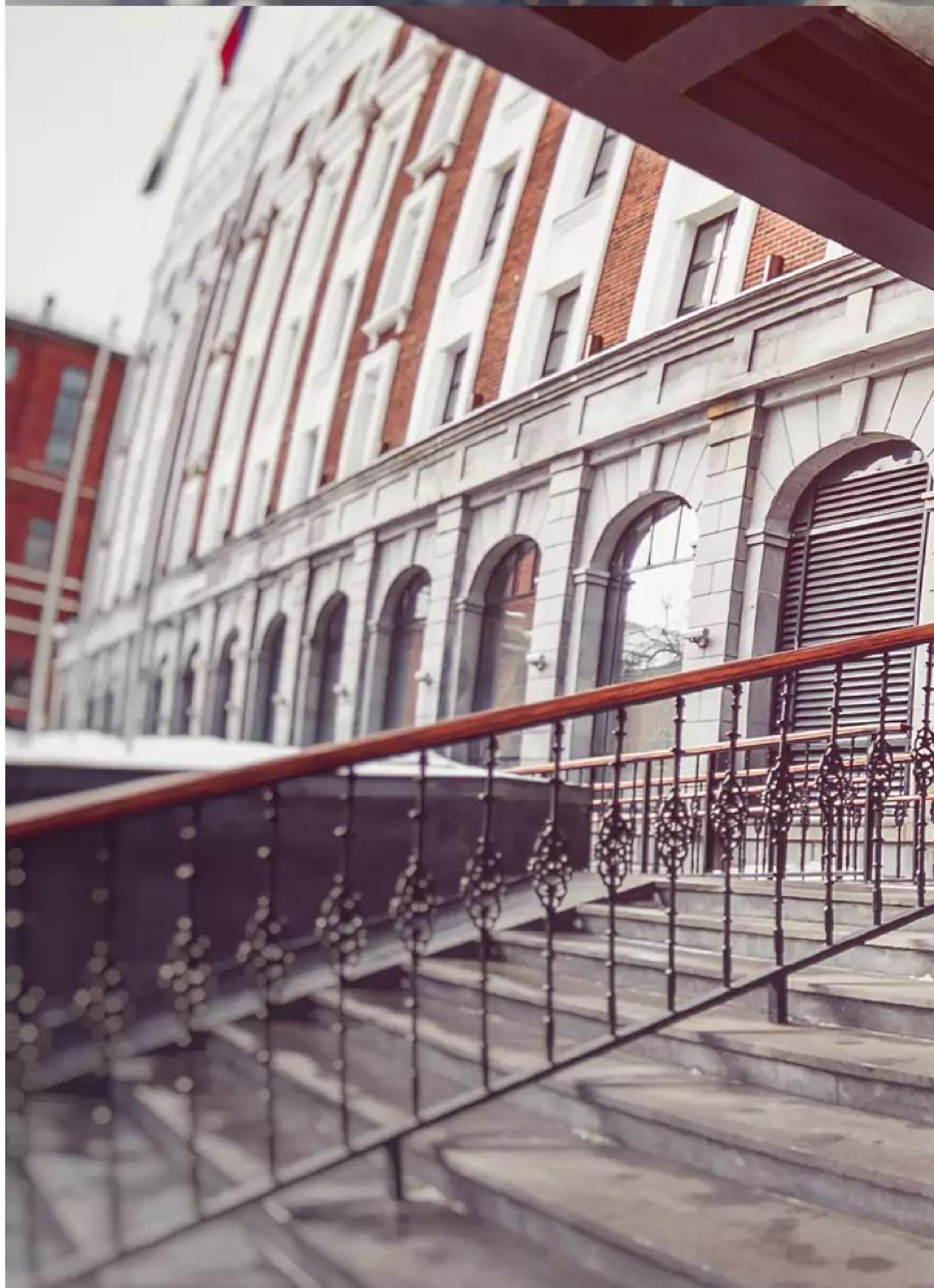
This photographer is using a very specialist lens to get this wide-angle photo of a bride and groom. The extreme nature of the distortion this lens gives you is apparent in the visible curvature of the building and the wide angle of view makes for a creative image.

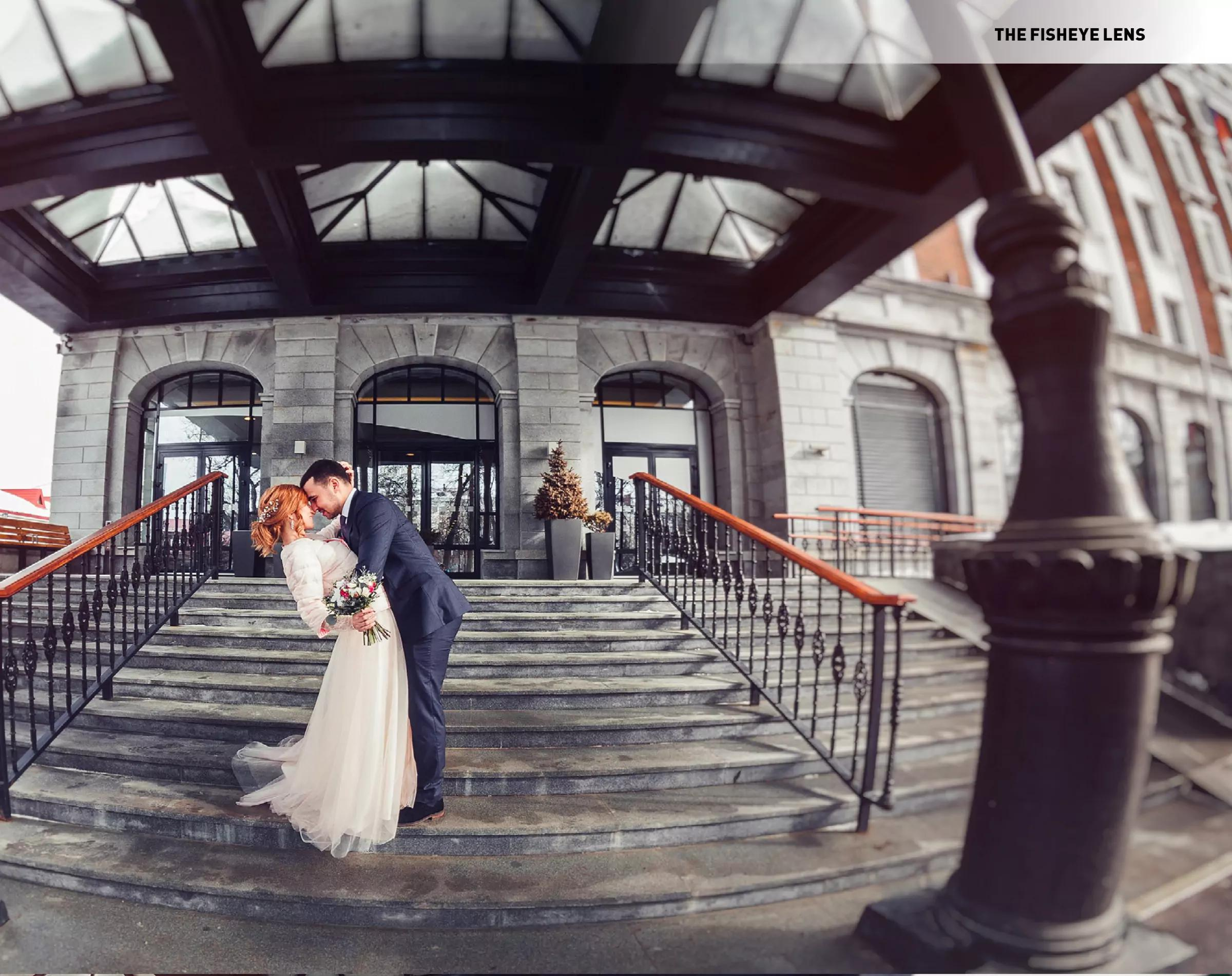
The kind of lens that can do this is called a fisheye. Whereas most lenses are trying hard to eliminate distortion, the fisheye uses it to its advantage to give you an unparalleled angle of view that can encompass 180°.

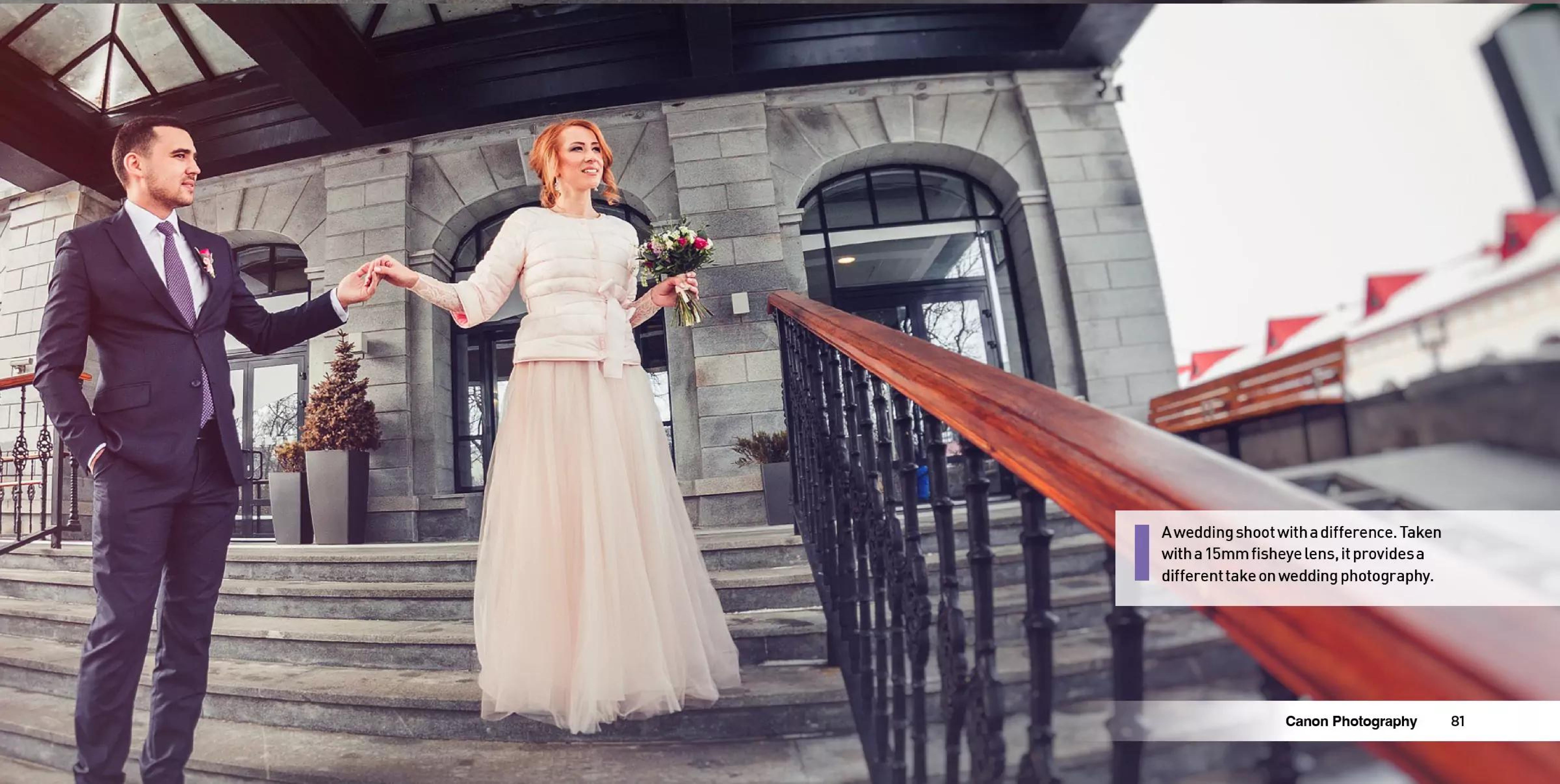
In the case of the example lens shown here, the Canon 8-15mm fisheye can actually create a fully circular 360° image at the 8mm end of the zoom range up to a 180° corner to corner image when zoomed to 15mm. Just be prepared to shell out well over £800 for the privilege. ■

See everything

The Canon EF 8-15mm f/4 L USM series fisheye lens. You can choose between a full-frame image or circular fisheye image by using the zoom. Although it is a full-frame lens, if you use it on an APS-C cropped sensor body, it acts like a 12-24mm wide angle zoom which is ideal for landscape photography.







A wedding shoot with a difference. Taken with a 15mm fisheye lens, it provides a different take on wedding photography.

> "It's best to take this sort of photo on a day that's bright, but not too sunny, because it's easy to burn out highlights on a longer exposure."

Misty water effect

Fast flowing water looks great with a slow shutter speed

This mist-like waterfall effect is very popular and looks great when it's done right. It looks challenging, but in fact it's very easy to set up. All you need is a tripod and any camera with manual shutter speed control.

The hardest part is finding a stream or river that has a nice photogenic waterfall or some rapids. Use your common sense and always exercise caution around fast-moving water; it may be deeper than it looks, with strong currents.

It's best to take this sort of photo on a day that's bright, but not too sunny, because it's easy to burn out highlights on a longer exposure. A calm day is best, because you don't want any trees or plants waving about in the wind and being blurred too.

Set up your camera using a good solid tripod on solid ground, and set the shutter speed to one second. Trigger the shutter using a cable release, a remote control or the two-second timer, so as to avoid any camera shake. You may need to experiment with different shutter speeds, depending on how fast the water is moving, but somewhere between half a second and two seconds should produce the effect you're looking for.

For longer exposures you may have to invest in a neutral-density filter to avoid over-exposure. ■

See the bigger picture

Canon
24-70mm
ULTRASONIC
AF MF

The Canon EF 24-70 f/2.8 L II USM series wide angle zoom lens. Top notch, fast optics make for a great landscape lens. It delivers amazing image quality throughout its zoom range and it's maximum aperture of f/2.8 allows for hand-held shooting in low light.

Careful control of shutter speed can produce some beautiful effects. This huge waterfall takes on a soft, almost mystical quality when photographed at a shutter speed of several seconds. Be sure to use a tripod though!

Overpowering the sun

With enough lighting firepower even the sun can be subdued

Overpowering the sun is not as strange as it might sound. It certainly makes for some striking portraits and has been very popular with fashion photographers for some time. The aim is to light your subject in such a way that the sun, which is directly in front of you, becomes a fill light rather than the key light. You might imagine that you would need a second sun of equal brightness right?

If you use the Sunny 16 Rule, you can expect your subject to photograph correctly in midday summer sunshine with camera settings of f/16 at 1/100s using ISO 100 (the shutter speed is always the reciprocal of the ISO number). Luckily, with a good enough flash set at full power just 7' away, we are not only able to match the sun's light output coming to us from 93 million miles away, we can overpower it.

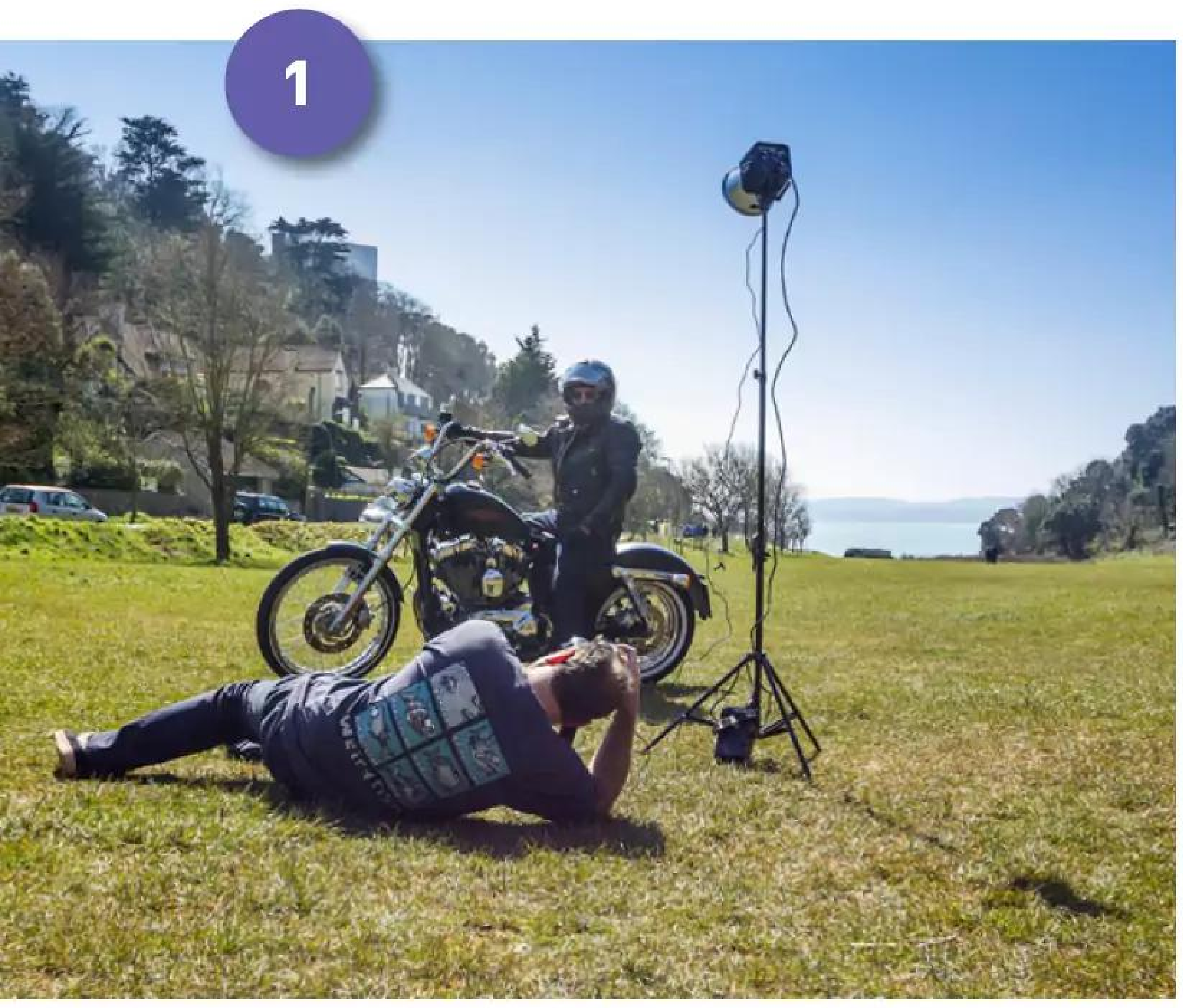
In this example our subject is set up with the sun directly behind them. We set the camera using the sunny 16 Rule and took a shot without the flash. It was reasonably well exposed although the sun will be blowing out a lot of detail in the sky. If we set the ISO to 50, according to the sunny 16 Rule the settings should now be f/16 at 1/60s using ISO 50. Taking another shot should produce a similarly exposed picture. Now, what we want for the shot is to be able to underexpose the ambient daylight by about 1-2 stops. This will ensure the sky doesn't blow out and the deliberately darker surroundings will help our subject 'pop' out of the shot once it is lit by the flash.

To this end we alter the settings manually to f/16 at 1/200 sec at ISO 50. All we've altered is the shutter speed. We've taken it up near the camera's max sync speed (the fastest speed at which the shutter can synchronize with the flash's operation). This new shutter speed is much shorter in duration than it should be to produce a well exposed shot. It will now underexpose the image because it is only letting in a quarter of the light it needs. This equates to 2 stops of underexposure, making the image darker.

Now it's time to add the flash to the mix. In this instance we're using a 3m sync cord as we are working in close proximity to our subject. Setting the flash at full power it is positioned about 8ft from the subject **[1]**. A test shot is taken, and after a little tweaking the final settings arrived at are f/11 at 1/200 using ISO 50 **[2]**. We found this was the best compromise for lighting the subject and also underexposing the background.

The flash used was an AlienBee AB1600 **[3]**. It is a good value, robust and above all, powerful flash. Perfect for situations like this where you are using very small apertures requiring a lot of light that a normal camera mounted flash couldn't provide. They run off mains electric, or for great portability, you can purchase lithium battery packs **[4]** specially designed to power AlienBees out in the field.

The final results **[5]** are certainly dramatic and these camera and lighting skills are worth keeping in your creative arsenal. The sun is now yours to control as if it were just one of your own light sources. ■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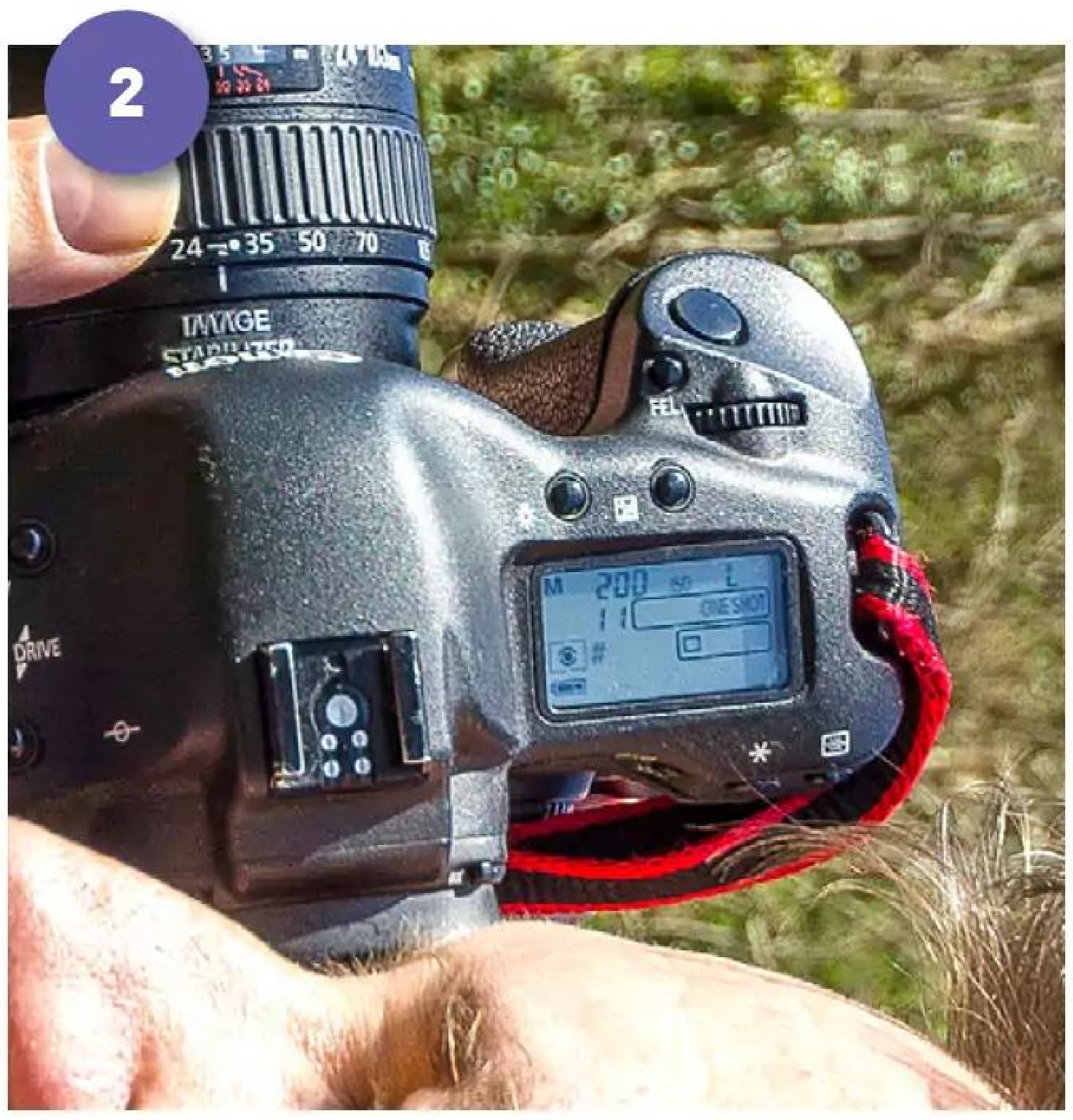
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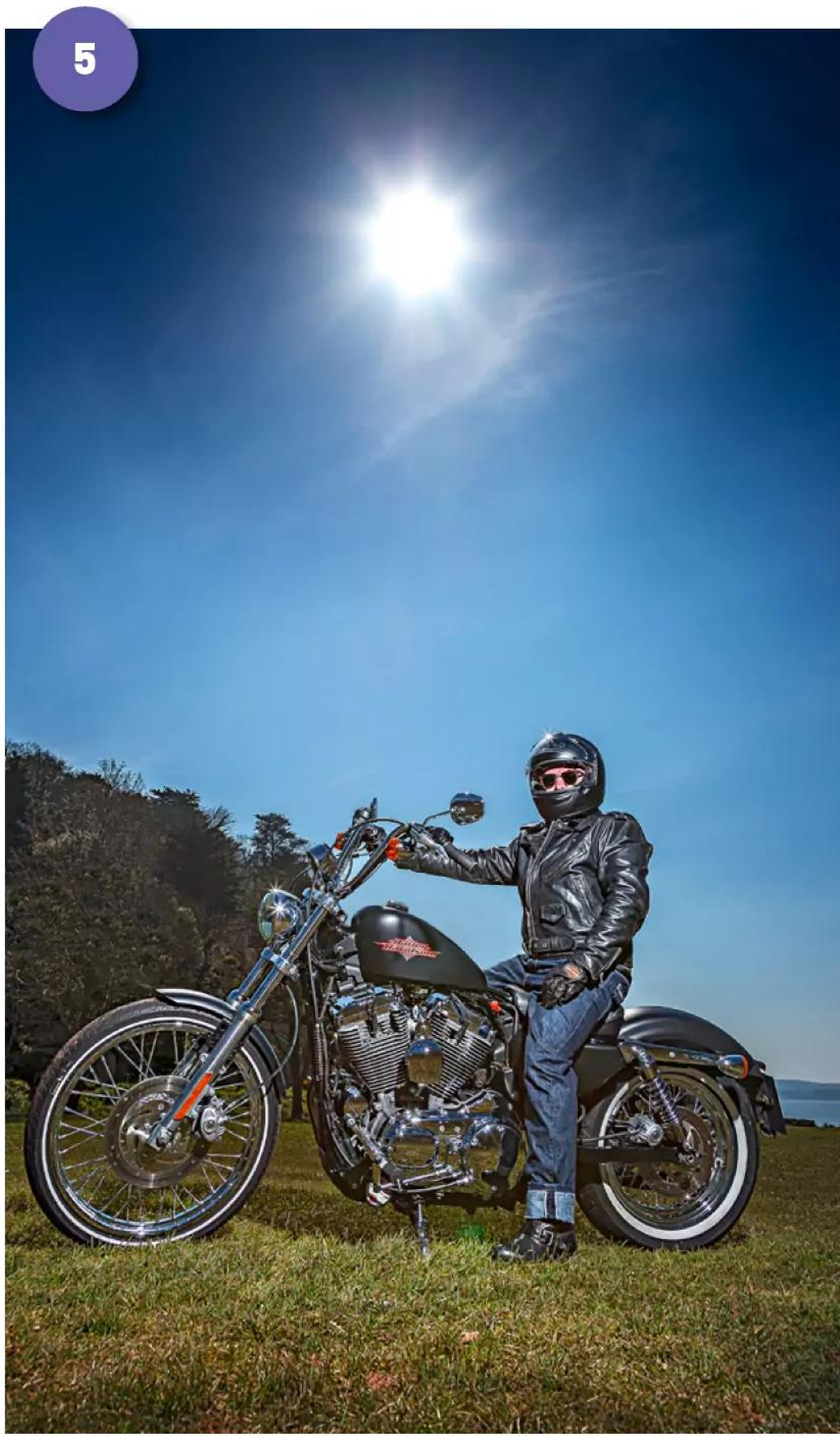
3

4

VAGABOND MINI
LITHIUM
Paul C. Buff, Inc. • Nashville • Made in USA


5

> “The sun is now yours to control as if it were just one of your own light sources.”

Defying gravity

High speed liquid effects

Here is another great little project to do indoors, or at least in your garage. It is a great trick shot that can make liquids appear to be defying gravity by pouring themselves out of a glass, rather than into it. This is quite a popular and relatively simple shot to achieve. In fact, the end results would make you believe it was a complicated studio shoot but it can be done on a table top. The only caveat is that there will be splashing liquids involved. So if you want to avoid any arguments about why the dining room is covered in coloured liquids, you may want to find a spot that is less likely to upset your family or take the time to lay down some cheap plastic sheeting.

No Photoshopping was used to create this effect of the liquid appearing to pour upwards out of the glass. This is an actual physical effect created at the moment of shooting.

> “The end results would make you believe it was a complicated studio shoot but it can be done on a table top.”

f/7.1 1/160

--

ISO 50

The concept

This kind of photography requires the use of a single flash that can freeze the action and capture a key moment as the contents of the glass seem to be making a bid for freedom. There is a little bit of setting up required to get everything prepared for the shoot. First things first though, how can a flash freeze the action? A flash delivers a burst of light from its flash tube, this light is of a fixed brightness and is always the same. In order to alter its apparent brightness, it is actually the duration of the flash that is altered. In this case, the flash we are using is an old Canon 430EX II. If it was fired at full power, the light pulse would last for about 1/350 of a second. If it were set to about 1/4 power, that duration would be greatly reduced to about 1/3000 of a second. This fast pulse of light is what we can use to freeze the action. It does require that the flash is the only lighting in an otherwise dark scene. The camera settings used have to eliminate any ambient light that might be present in the scene. If you were working in your dining room, you could draw curtains or even shoot after dark to make sure there is no stray light.

Controlling the liquid

The next thing is to explain how you can make the water leap out of a glass. The idea is to quickly slide the glass of liquid into shot and bring it to a sudden dead halt at a predetermined point. This motion and the very sudden deceleration will result in the liquid splashing to one side of the curved glass and being catapulted up into the air. The point at which this happens is when you take the shot. It requires a glass that can be glued to a surface so it is immobile. Rather than risk an actual glass, we ordered some good quality polycarbonate wine glasses. They are virtually unbreakable and lighter than their glass equivalents. The glass was glued to the middle of a Perspex sheet with strong superglue. It can be any appropriate surface, as long as it is rigid and you can bond the plastic wine glass to its surface. We left it overnight to bond and then we were ready for the next part.

Supergluing a plastic wine glass to a Perspex sheet may sound a bit daft but the results will hopefully speak for themselves.

Bostik
GLU FIX

Canon
SPEEDLITE 430EX

A Canon 430EX II. A budget flash but still capable of delivering the power needed for this shooting session.

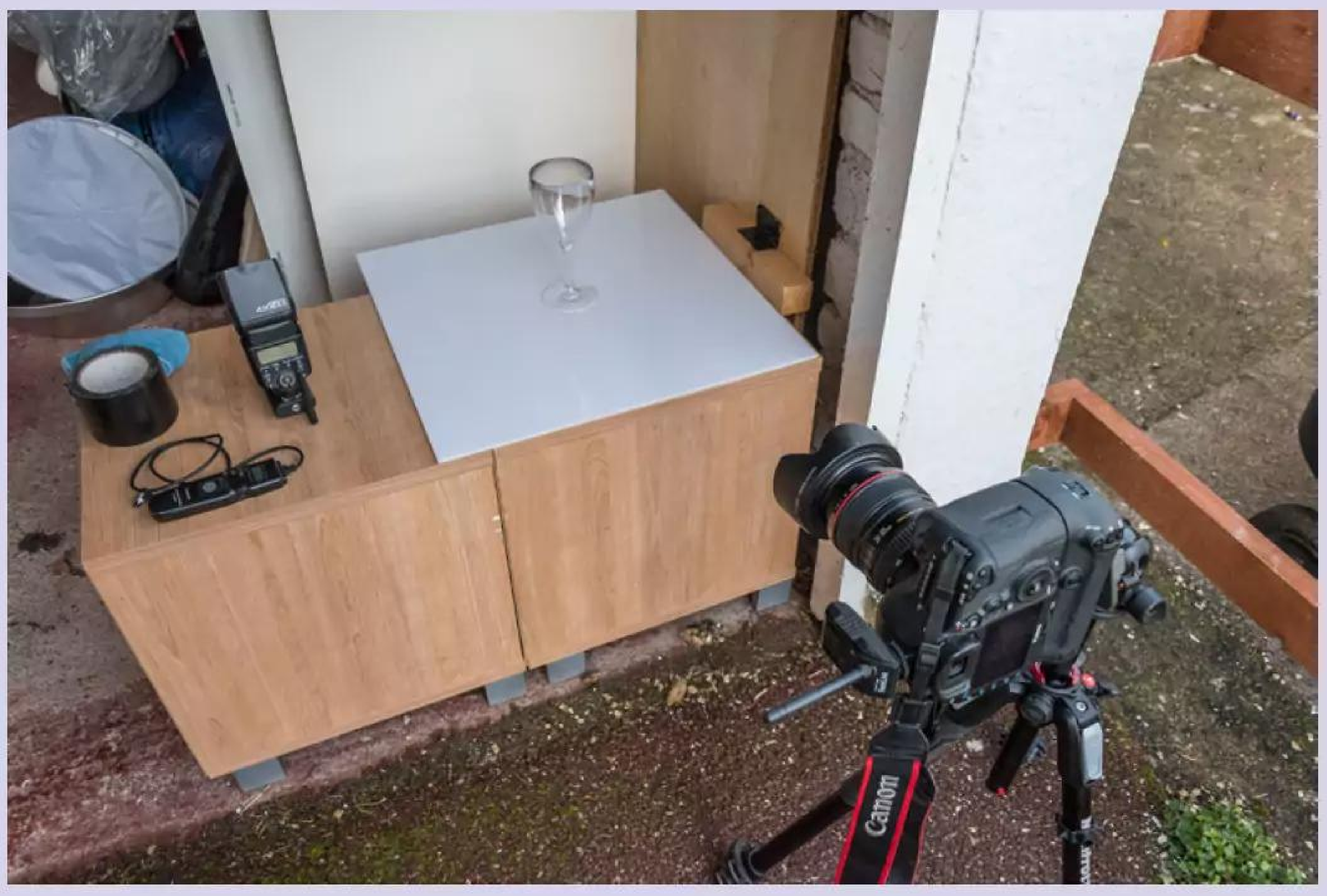
Below are the approximate flash durations for the 430EX II at each of its power output settings.

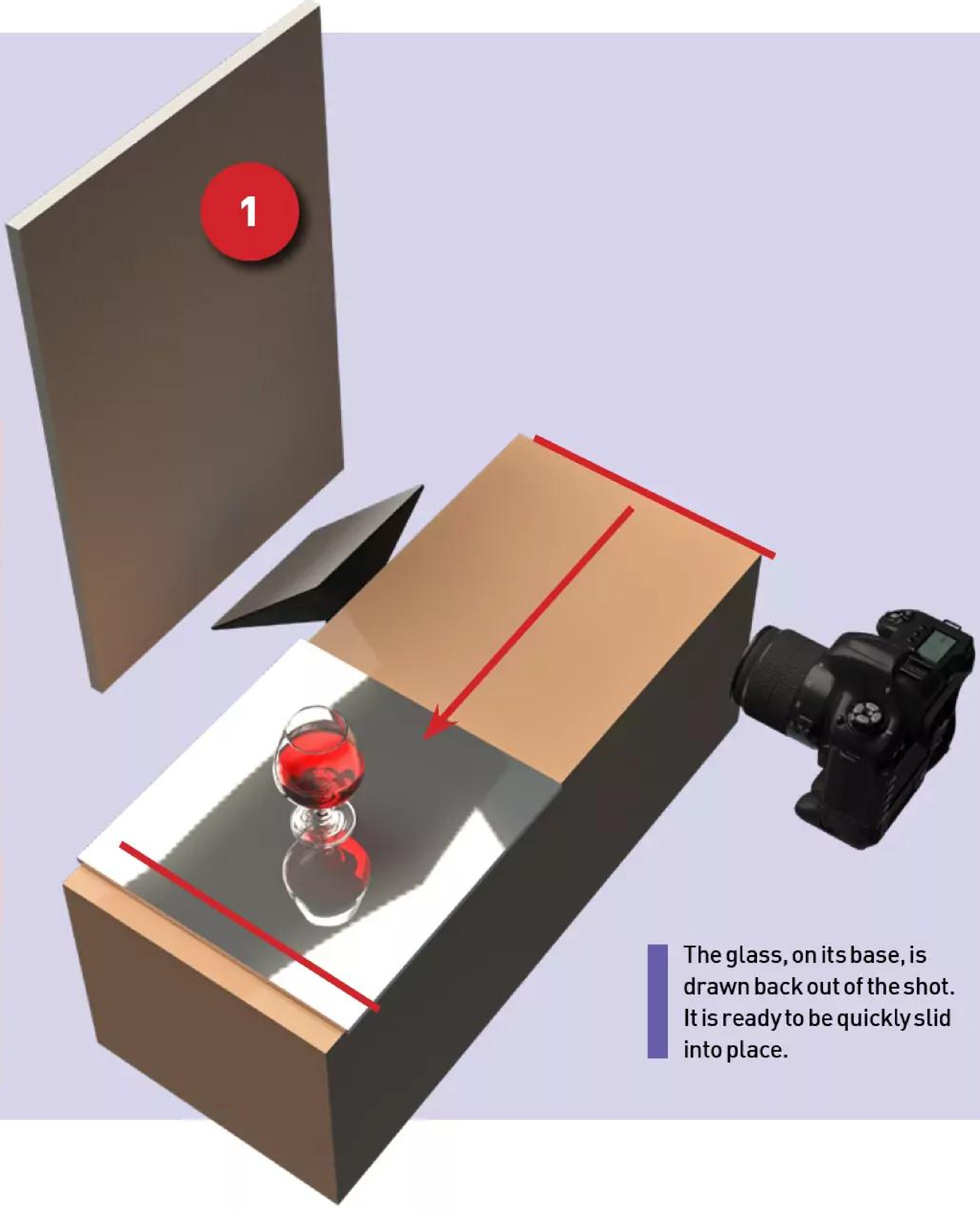
Power	Duration
1/1	1/350
1/2	1/1630
1/4	1/3000
1/8	1/4300
1/16	1/5250
1/32	1/5600
1/64	1/6500

ETTL Zoom 105mm
+ 1/3 F– 4.0
☼/C.Fn
MODE
ZOOM/
PILOT
ON
OFF
OFF
SLAVE

Tough and relatively light, these polycarbonate wineglasses are ideal to use in this photographic illusion.

The procedure





The glass, on its base, is drawn back out of the shot. It is ready to be quickly slid into place.

Wine or water?

It's your choice as to what liquid you use but it's a good idea to have something that is bright, but not too opaque. You want light to be able to shine through it. We opted for food colouring mixed in water. This meant we could use different vivid colours and also control the density of colour in the water.

Setting up

We decided to clear a space in the garage to set up the shot. You could use the dining room or any available surface. Just be aware of the splashes you are going to be making soon. We placed the Perspex sheet with the glass on top of a couple of old bedside cabinets next to the wall of the garage. This gave us a surface we could slide the Perspex sheet back and forth on.

The sheet could be slid to one side and contact the wall and come to a dead halt. The camera was set up on a tripod and the composition framed to capture the glass in this position. We were using a Canon 5DMKIII and EF24-105mm f/4 lens.

The camera was kept at a decent distance to avoid splashing and we used Live View to frame the shot. Bear in mind that you will need to compose the shot in such a way as to leave a blank space above the glass to give you room to capture the liquid as it splashes upwards. A sheet of white card was placed about 500mm behind the glass to use as a backdrop and also bounce the flash off.

Flash settings

We took the flash and a wireless receiver was connected to it. The wireless transmitter was connected to the camera. The flash was set at just under 1/4 power in order to give us a flash duration of about 1/3000 of a second, which would be enough to freeze the action. The flash was then placed behind the wine glass, on the ground, with the flash head tilted up towards the white backdrop. When the flash fires, it illuminates the white sheet, which in turn lights the glass of liquid in front of it. Because the flash is at less than 1/4 power, it means that we can fire it a few times before the charge it's holding is depleted. This gives us two or three chances each time, improving the odds of a successful capture.

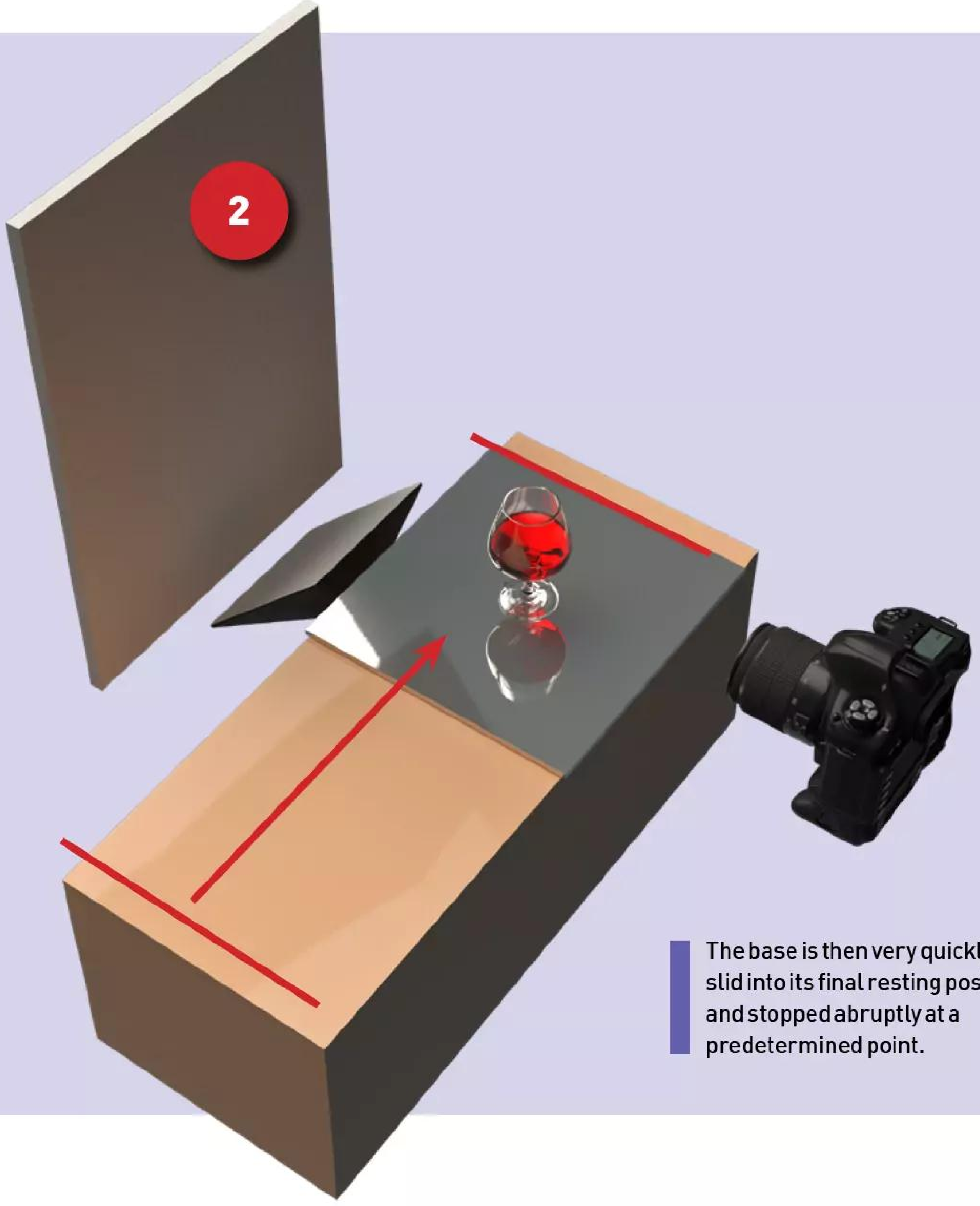
Filling up

We had a jug of water and we mixed drops of bright pink and dark blue food colouring together to make a bright lavender colour. We then used a small plastic tube to siphon some liquid into the wine glass until it was about half full. There was a final check to clean surfaces and wipe any unwanted drops off the glass and we were ready.

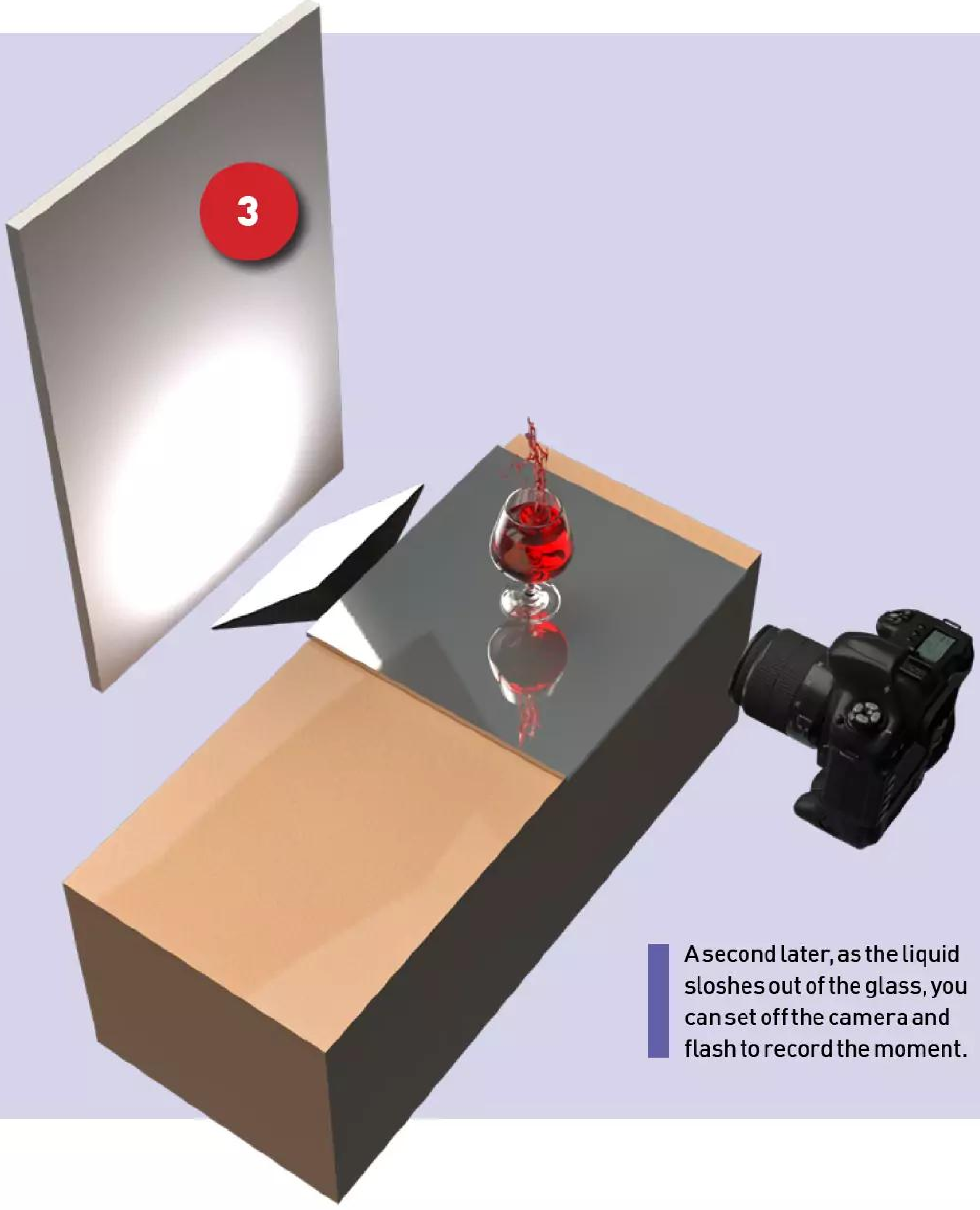
Camera settings

Next, we needed to dial in some settings on the camera. We manually set an aperture of f/7.1, shutter speed of 1/160 and ISO 50. A test shot revealed the shot was virtually black and no

The flash was controlled wirelessly by the TwinLink receiver, which was fired when the shutter button was pressed on the camera.



The base is then very quickly slid into its final resting position and stopped abruptly at a predetermined point.



A second later, as the liquid sloshes out of the glass, you can set off the camera and flash to record the moment.

PYREX
1 LITRE
ClassiKool
Royal Blue
ClassiKool
Hot Pink

Using food colouring means you can achieve some very vivid colours which helps with the overall surreal feeling of the shots.

SET
LOCK
START/STOP
Canon
INFO.
MENU
RATE

If your camera has Live View, you can pre-focus the camera on the subject and keep it in manual focus mode so it doesn't try to refocus.

M-Fn
WB
AF•DRIVE
ISO
AWB
160
7.1(243)
M
FOCUS
ISO
L
RAW
AF-ON

ambient light in the garage was showing up in the shot. Then the focus was set manually on the front of the glass and the shooting mode was set to High Speed Continuous. This meant we could capture a sequence at six frames per second and give us more chances of capturing the best liquid splash. A cable release was connected to the camera as well, to avoid any unnecessary movement. A few test shots confirmed that the flash power was good and the liquid had the right translucency. So far, so good. Now came the moment of truth.

Cleaning up after each attempt was a bit of a pain but necessary.

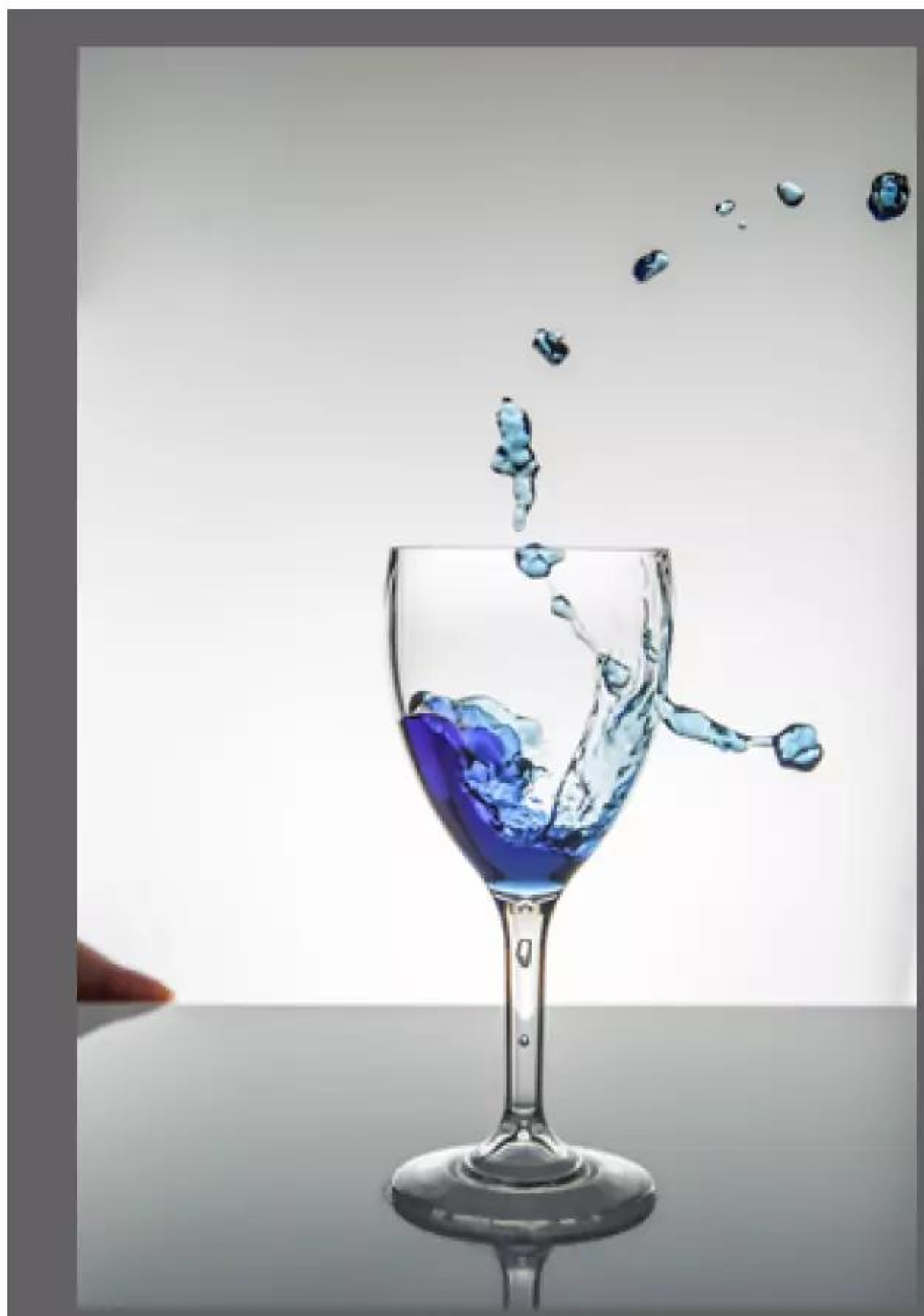
A cable release is a handy piece of equipment. It means you don't have to touch the camera once it is set up.

SELF INT. LONG FRAMES
00:04:00
START STOP
ILLUM.
Canon
TIMER REMOTE CONTROLLER
TC-80N3

Some of the shots that didn't make it are shown here. Note that they were shot in Raw format to give us maximum quality at the processing stage.

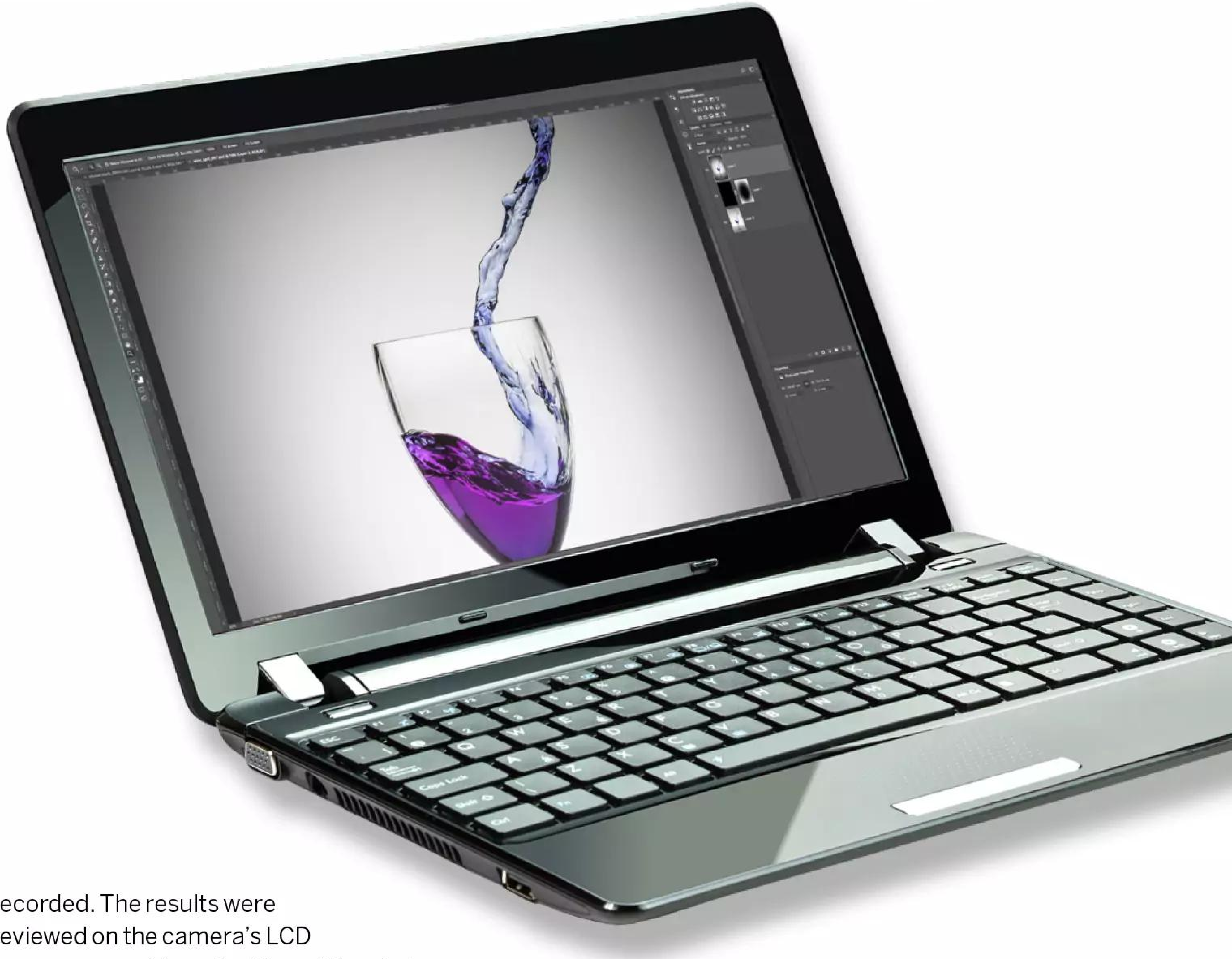
wine_spill_072.CR2

wine_spill_093.CR2



wine_spill_102.CR2

wine_spill_088.CR2



First attempt

This is a two person operation. One would be responsible for sliding the sheet, with glass attached, into position, and one would be ready with the cable release to fire off a burst of shots as it comes to a halt and the liquid spills. The perspex was drawn back out of shot and after a countdown, was slid quickly into frame and stopped when the sheet contacted the far wall. At this point the camera was fired via the cable release and several shots of the result were recorded. The results were reviewed on the camera's LCD screen; we could see that two of the shots had captured some great splashing. It worked. Now it was time to clean the surfaces of all the spilled liquid and set it up again for another try. We did four attempts and got some very cool images.

Post processing

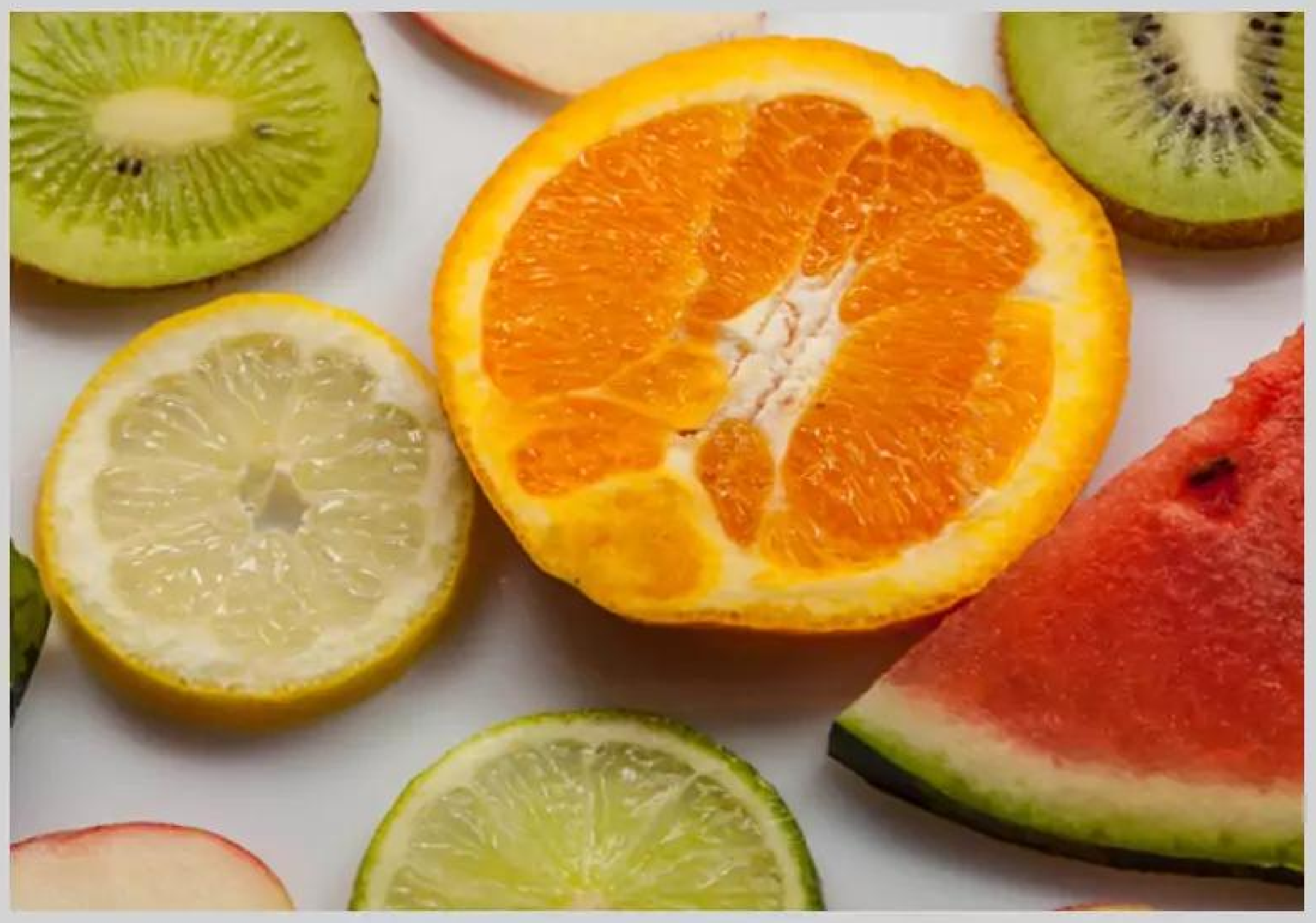
All we had to do now was get the shots back onto the computer and review them. We were pretty happy with the results and picked out four favourites and one base original as comparison.

Because the scene was essentially monotone apart from the coloured liquid, it meant we could alter the hue and saturation of the splashes and get different colours without having to mix food colouring whilst we were shooting. Our gravity defying trick shots were complete! ■

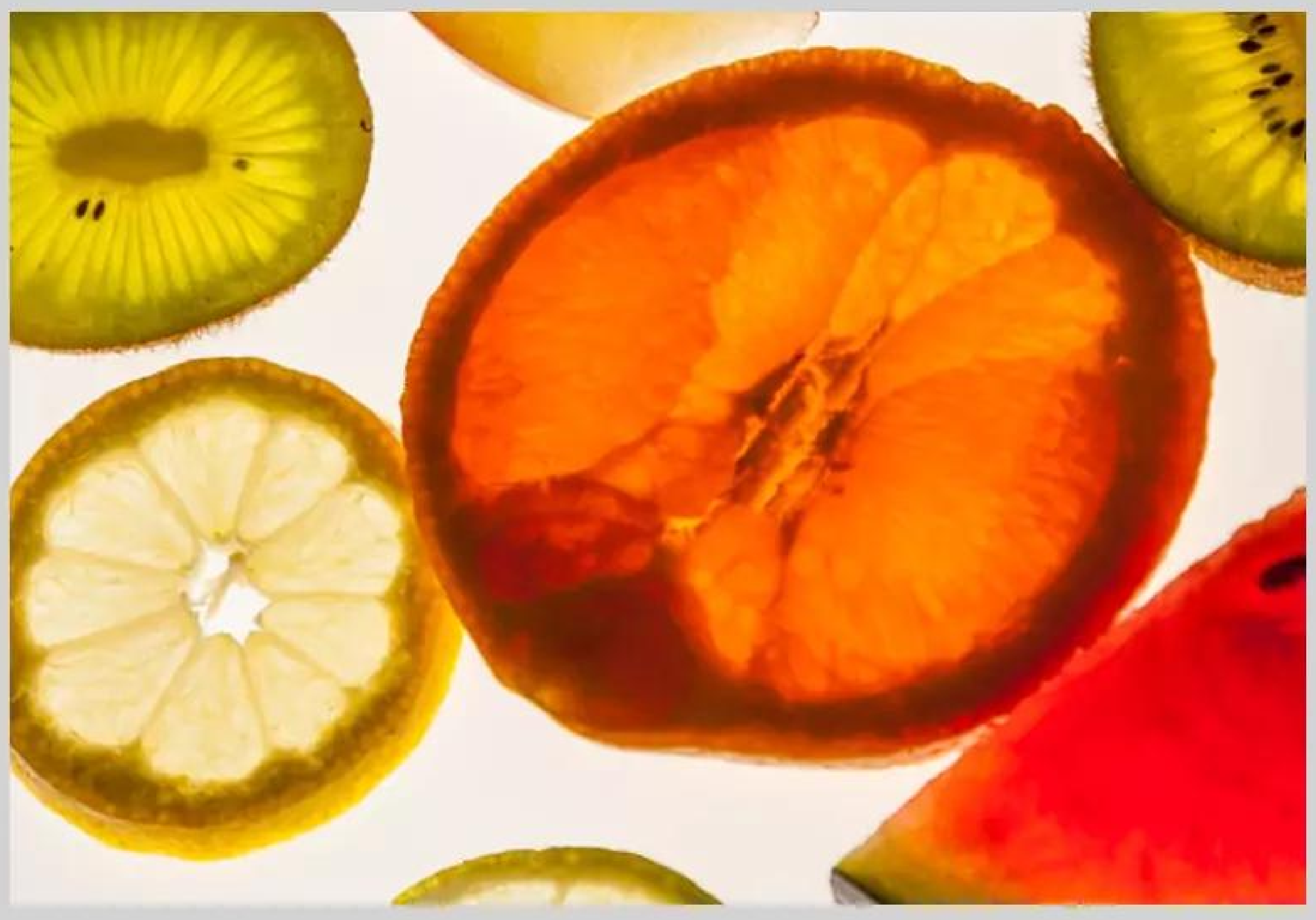
Food photography

Get arty with some everyday food items

Back in the day, it was always something of a cliché to shoot or paint a bowl of fruit as an indoor still life project. It doesn't have to be that way, especially in the world of digital photography. Using fruit as your still life subject can be given a little twist with this easy to setup tabletop project. Rather than having a bunch of fruit in a bowl, how about something a little more creative? Sliced fruit pieces are a lovely, translucent material, in a range of great colours. All well and good, but what if you shine a strong light through them? Now things get interesting. Suddenly the fruit glows and internal shapes and structure are seen. This is not how you normally see fruit and it sounds like a great image to capture.



These two comparison shots demonstrate the key visual difference that can elevate your food images away from the mundane. The image on the left is lit in a conventional way where the surface of the fruit reflects light as you would expect. The shot on the right is lit from below so now the light is transmitted through the flesh of the fruit and your food is suddenly given a great new look.

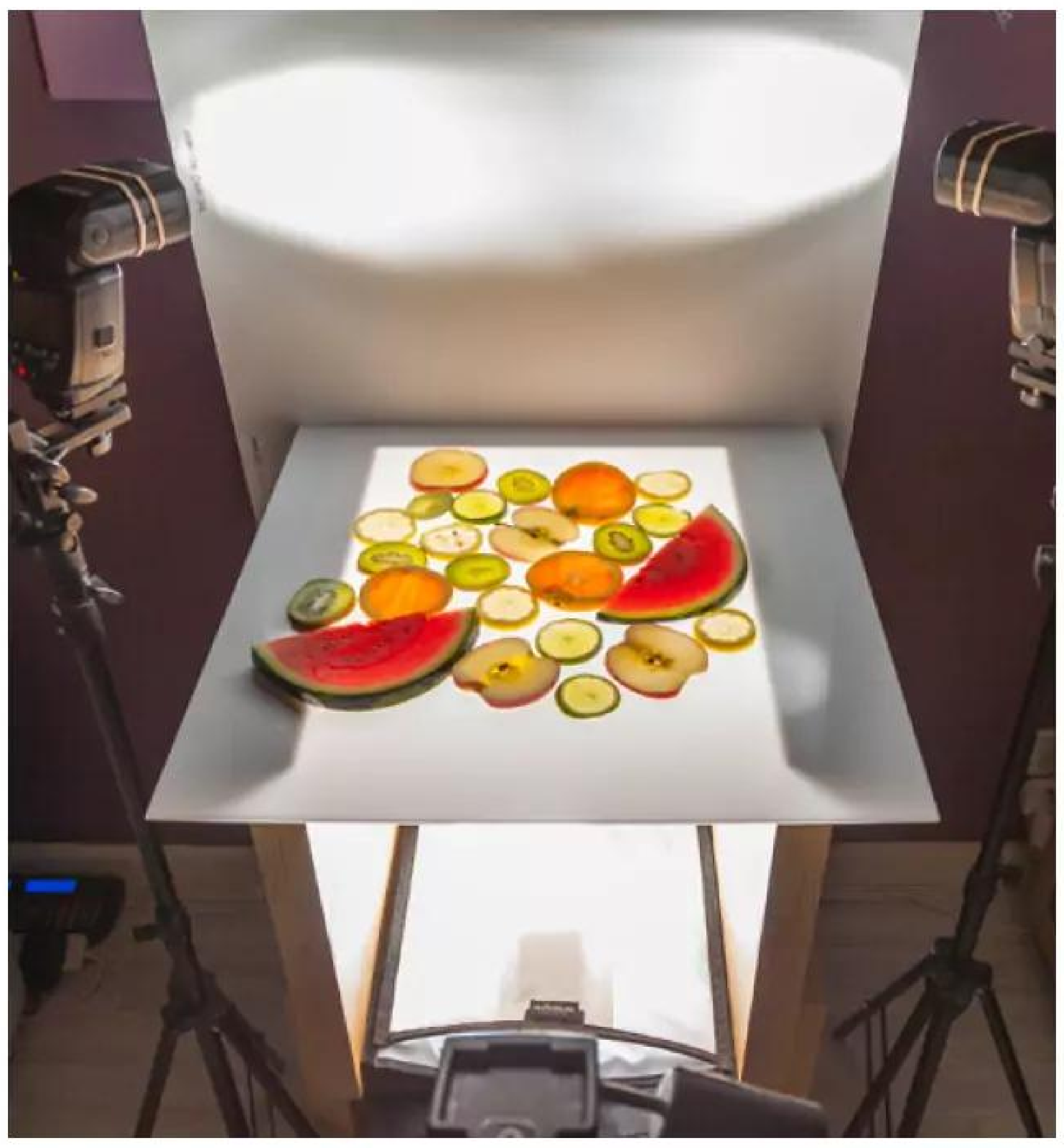


Box clever

To achieve this, you would need a light source of some sort that you can arrange your sliced fruit on. An old-style light box for viewing slides and negatives sounds ideal but they aren't necessarily just lying around your house waiting to be used. As an alternative, you can use a plastic storage box lined inside with some thin white paper that you can shine a powerful torch or lamp through to give you your light box. For our example, we are going to use a 500mm square sheet of white translucent Perspex purchased online quite cheaply.

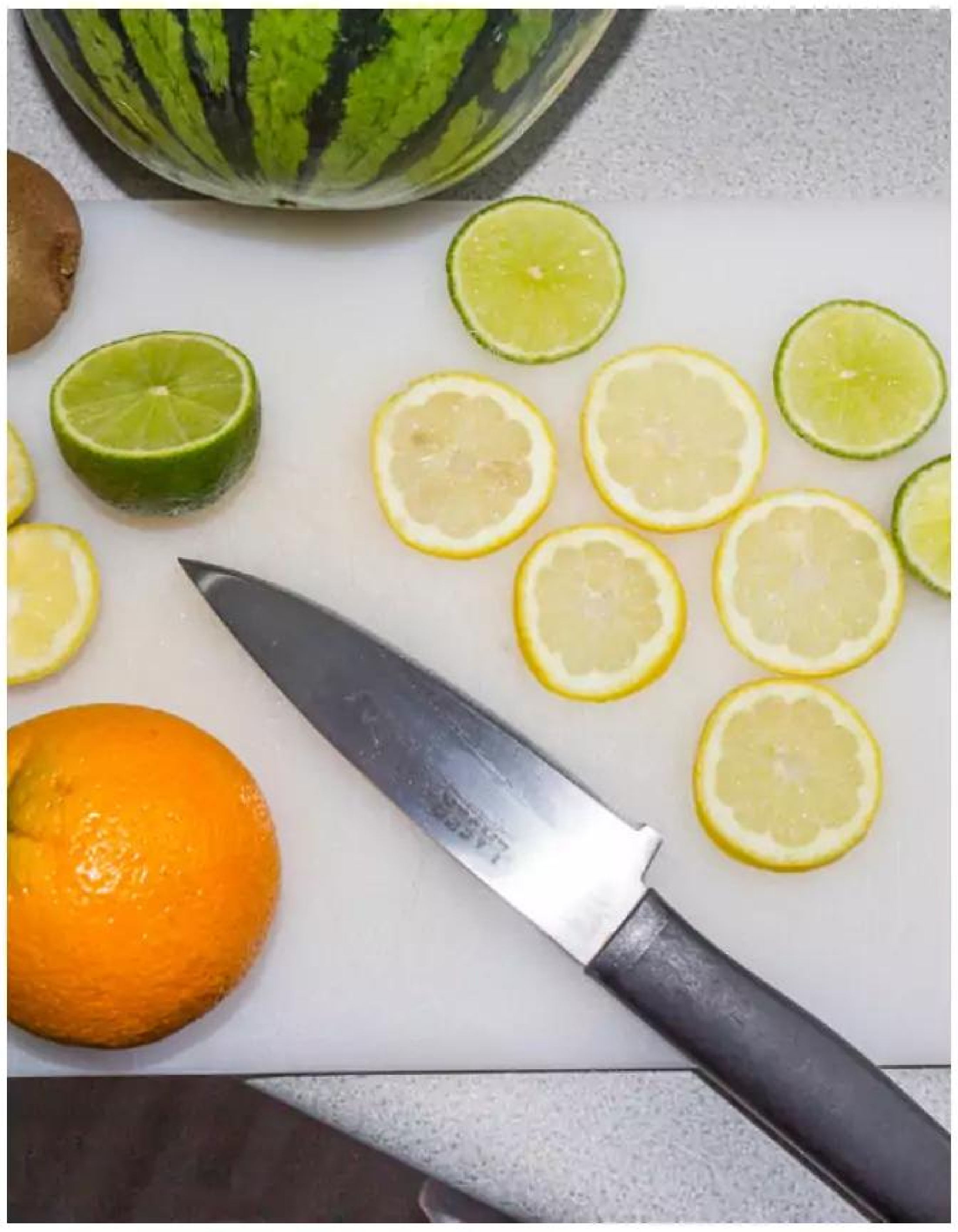
Setting up

The Perspex is set on the legs of a small overturned table and one flashgun is set underneath to fire upwards into it. A two-flash setup is used above to create some fill light by bouncing off a piece of white card onto the Perspex surface and cast some illumination on the slices of fruit. Our camera and a 24-205mm zoom lens is set up in front and above to capture the image. All flashes are controlled wirelessly but you can easily replace flashes with lamps or powerful led torches.



Slice and dice

Now we need fruit. The citrus and pulpy type fruits are perfect for this kind of shoot. They have great texture and colour. This example employs apples, oranges, lemons, limes, kiwi and water melon. The trick is to slice them nice and thin. Too thick and the light will have trouble passing through them. Slice up as much as you need (or have room for on your home-made light box) and arrange the slices to suit your needs. Our example is just a random assortment laid out on the Perspex sheet.



Dialling it in

Now we need to do a few test shots. After some test firings we have our settings dialled in. Bear in mind, if you are using lamps or torches, your exposure times will differ. Just make sure the most powerful light is the one underneath, shining through the fruit. The flash underneath firing up into the fruit was set on 1/16 power, whilst the two flashes above were each set at 1/64 power. The camera was dialled in manually at ISO 50, aperture f/5.6 and shutter speed 1/160 which is the max sync speed of the camera. This made sure the bottom light is getting through all the fruit slices without over-exposing any of them.

Variety

Now it's just a case of shooting away to your heart's content. Rearrange your fruit as you see fit. Try different angles and zoom levels. In our example, it was quickly realised that having the camera on the tripod was too restricting so we went hand-held with it instead. As the camera settings had given us a shutter speed of 1/160 and the flash duration itself was effectively freezing any movement, we could shoot without worrying about camera shake of motion blur. For a spot of variety, the 24-105mm zoom lens was swapped out for a 100mm f/2.8 macro lens for some close-up detail work. Shooting with the lens at its widest aperture of f/2.8 meant the power of the flashes had to be adjusted. The flash firing upwards was adjusted to 1/32 power and both top flashes were set to 1/128 power.

Pick your fruit

Once the shots were in the bag, they were reviewed and the favourite images processed through a raw editing program, in this case Adobe Camera Raw. There were some interesting compositions that would not look out of place as large format canvas prints. Creative dropping also heightens the abstract feel. In fact, the only problem that remained, was what to do with all the fruit that was left over. Fruit salad anyone? ■

The stand-in safari

A trip to the zoo can help sharpen your photography skills

The excitement of photographing wildlife in its natural habit on the plains of Africa, or in the Congo basin is beyond all but the most intrepid and experienced wildlife photographers. The images captured can be breathtaking and unlock the wonders of natural world when presented to us on the covers of prestigious magazines such as National Geographic. Experience, funding, and some very specialist equipment is the order of the day for the top-level wildlife photographer.

f/5.6 1/200
-0.33
ISO 800

f/5.6
1/200
-0.67
ISO 400

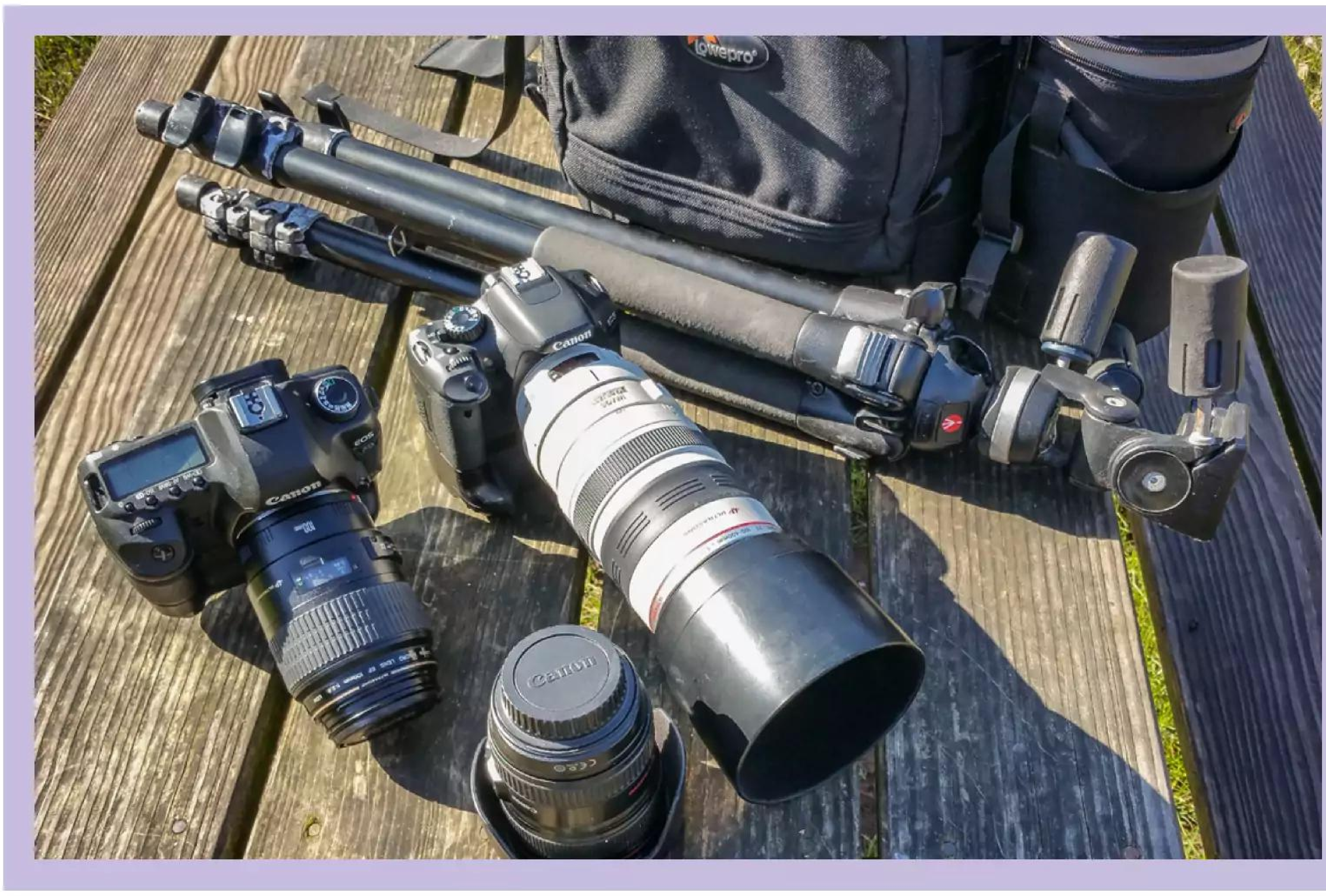
How about the rest of us would-be wildlife photographers? How is it possible to begin to develop the skills required when Lions and Elephants aren't exactly thick on the ground in the streets of your local town? An excellent place to start, is at your local zoo. Agreed, it's not exactly the wilds of Borneo, but there will be a range of exotic creatures big and small that you can try your photographic skills out on.

The animals

If you think about it, the Zoo is a great place to practice. It is a safe environment, and the animals are easily accessible. Obviously some animals, such as the primates, can only be viewed from a distance. In some cases, all that separates you from a Cheetah, for instance, could be a single sheet of clear polycarbonate. However, in other cases, certain animals can actually be petted or fed directly, which gives you choices for some interesting close-up work too. Also, if the animals aren't presenting themselves for the camera, there is also that most entertaining creature, the human being.

The challenge

The zoo environment creates challenges that are not vastly different to capturing animals in the wild. You may have to shoot your subject from a distance. They may present a moving target and may be moving from a well-lit open area to more densely foliated areas. The rules of composition are still in effect, as is general photographic technique to ensure sharp, blur-free shots. There is also the additional challenge of the zoo itself. You will be shooting through cages or from behind glass and plastic, and you'll have to bear this in mind when composing your shots to make them look as natural as possible.



For our 'safari' we went to Paignton Zoo in Devon. We tried to keep our gear choice fairly minimal. We had an old 18MP Canon EOS 550D to which we attached a 100-400mm EF f/4 lens for an effective focal length of 160-640mm to give us a little more reach for shooting distant subjects. For the indoor low light enclosures such as the reptile house, we went with a Canon EOS 5DMK2 and a 100mm macro lens with a maximum aperture of f/2.8. This meant we could attempt to capture some nice close-ups of the creatures in their display cases. We would still have to shoot high ISO images but the wide aperture of f/2.8 gave us a fighting chance of getting some decent images at reasonable shutter speeds. We also had a sturdy tripod if needed for when slower shutter speeds no longer enabled hand held shooting. We also had a 24-105mm f/4 lens that we didn't use in the end. Topping it off was a good camera bag that could be slung over the shoulder and was not too intrusive while walking about.

1

2

3

4

The equipment

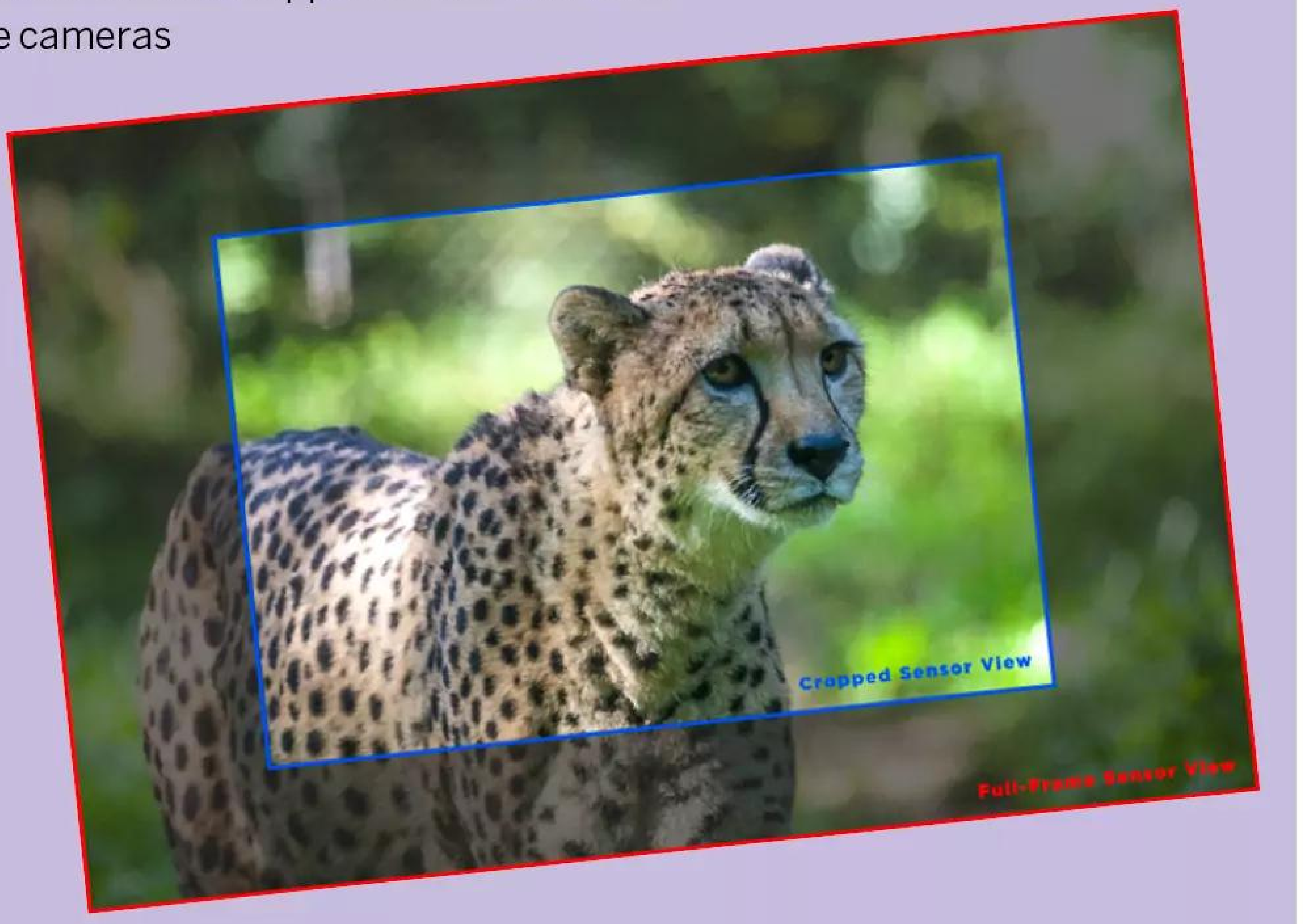
You are planning a trip to the zoo. What should your gear choices be? This will depend on your shooting style, but in the same way a landscape photographer will always have a wide-angle lens in their bag, a wildlife photographer will have a zoom lens. It doesn't mean you have to go out and spend thousands on a dedicated super-telephoto lens such as the Canon EF 800mm f/5.6 at nearly £10,000 **[1]**. You can actually buy a Korean super-telephoto 650-1300mm f/8-f/16 lens for £150 **[2]**. You would have to be aware though, that at this price-point, it is not going to be exactly world-class quality. Happily, there are other options. The current crop of super-zoom digital cameras are very affordable and offer optical zoom in the order of 30x to 80x magnification. The Canon PowerShot SX60 HS **[3]** has a 16MP sensor and a huge 65x magnification, which is comparable to a full-frame camera with a 24-1560mm lens. If you don't have a super-telephoto, you can always choose to crop your shots in your image editing software. The higher the resolution of your sensor, the more cropping power you'll have.

Double up

If you already have a DSLR with a medium telephoto in the 70-300mm length range, you could buy a focal length extender **[4]** and double the lens to 140-600mm. The big names like

The crop factor

Another option is to use a camera with a cropped sensor and use a lens designed for full-frame cameras on it instead. As an example, for some of the shots used in this article, a Canon EOS 550D was used with a Canon EF 100-400mm f/4 zoom lens. The lens is designed to project an image onto a sensor 1.6x larger than the one used in the 550D. The actual focal length of the lens does not change but the 100-400mm focal length range on the lens now appears as if it were 160-640mm.



Canon and Nikon offer these extenders for around £350, but you could always opt for third party brands like Yongnuo at up to half the price.

Get close

Now we have some options for shooting at long range. What about close-up? If you have a macro lens or your camera has a macro setting, then remember places like the reptile house or butterfly enclosure might allow you to get some interesting macro shots. In both cases, whether shooting at long focal lengths outdoors or shooting macro indoors with low light conditions, a tripod will be essential to keep your images free from motion blur. Be aware when moving indoors to a simulated tropical environment from a cold outdoor setting, that you risk your camera and lens fogging up when the cold metal and plastic of your gear hits the humid air of the much warmer enclosure.

When cold camera equipment meets warm humid air, the result is fogging of the lens and viewfinder and the chance of condensation build-up on your gear. If you can, make the transition between the two as gradual as possible. Some photographers have been known to put a cold camera or lens under their own coat in an attempt to warm it up a little before going into a humid environment.

Scout around

When you arrive at the zoo, it's generally a nice idea to walk around first and figure out where the best shooting angles might be for any given enclosure and when certain animal's feeding times might be. If you have to shoot through cages or bars, are there any apertures big enough to let you put the lens through so you do not capture any distracting zoo hardware in your shots? Failing that, shoot at your widest aperture for shallowest depth of field with the bars close to your lens and capture the animal at a point furthest from you and the cage you are shooting through. With a little luck, the cage will be out of focus enough not to distract too much. If you are shooting through glass, pick a spot where the glass is clean (or give it a wipe) and shoot square on through the glass, even pressing the lens hood against the glass to try and reduce as much unwanted reflection and glare as possible.

Eyes open

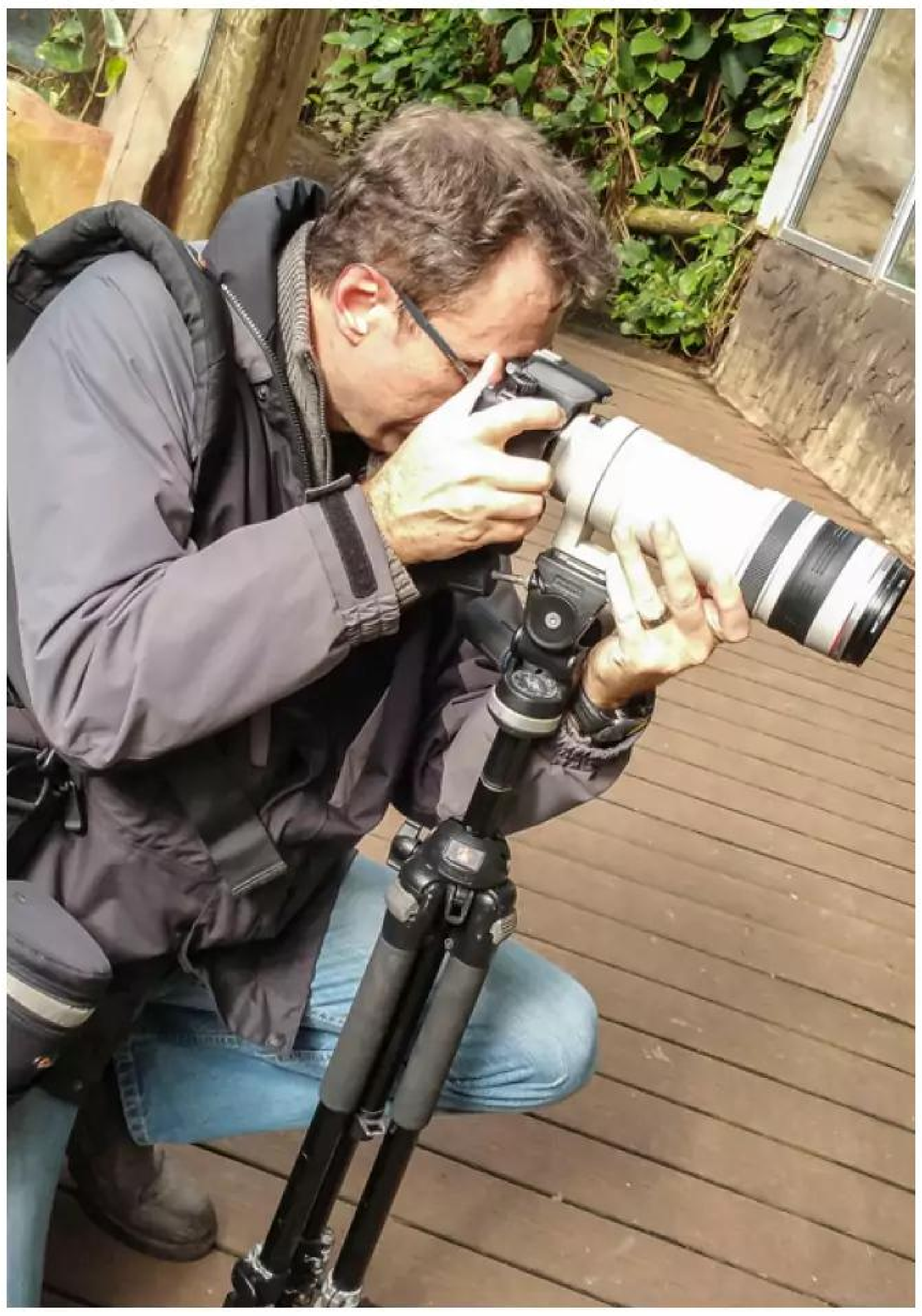
When you photograph a person, a key consideration is to get the eyes in focus to connect the viewer to the subject in the shot. That holds true when photographing animals too. Make your focus point the eyes of your subject, or the eye closest to you if they are at an angle. If you are photographing a smaller creature, get down to their eye-level if the conditions and enclosure allow it. Photographing a pot bellied pig whilst standing up means you only see it from a human perspective. Photograph it from its point of view for a more intimate shot.

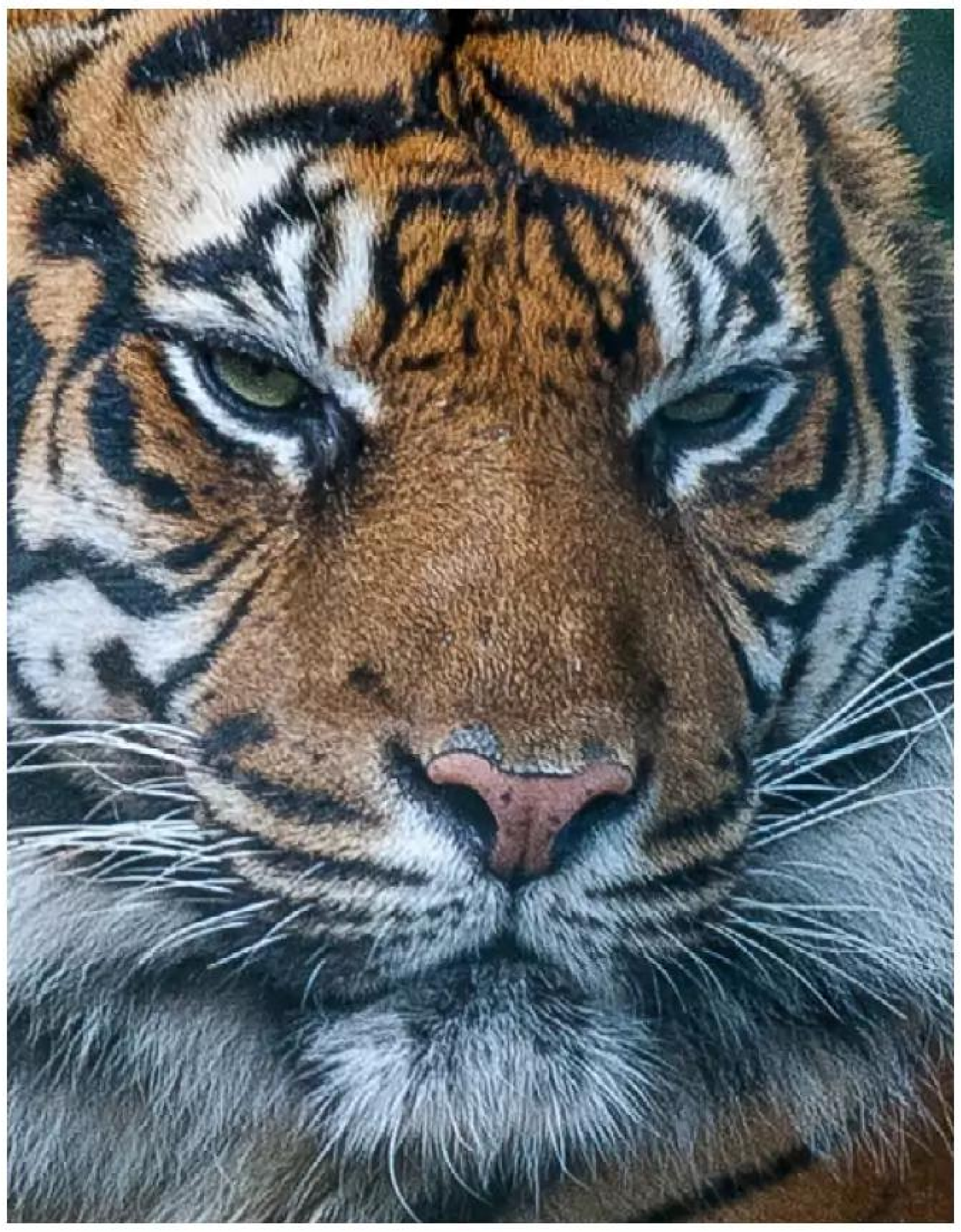
Wait for it

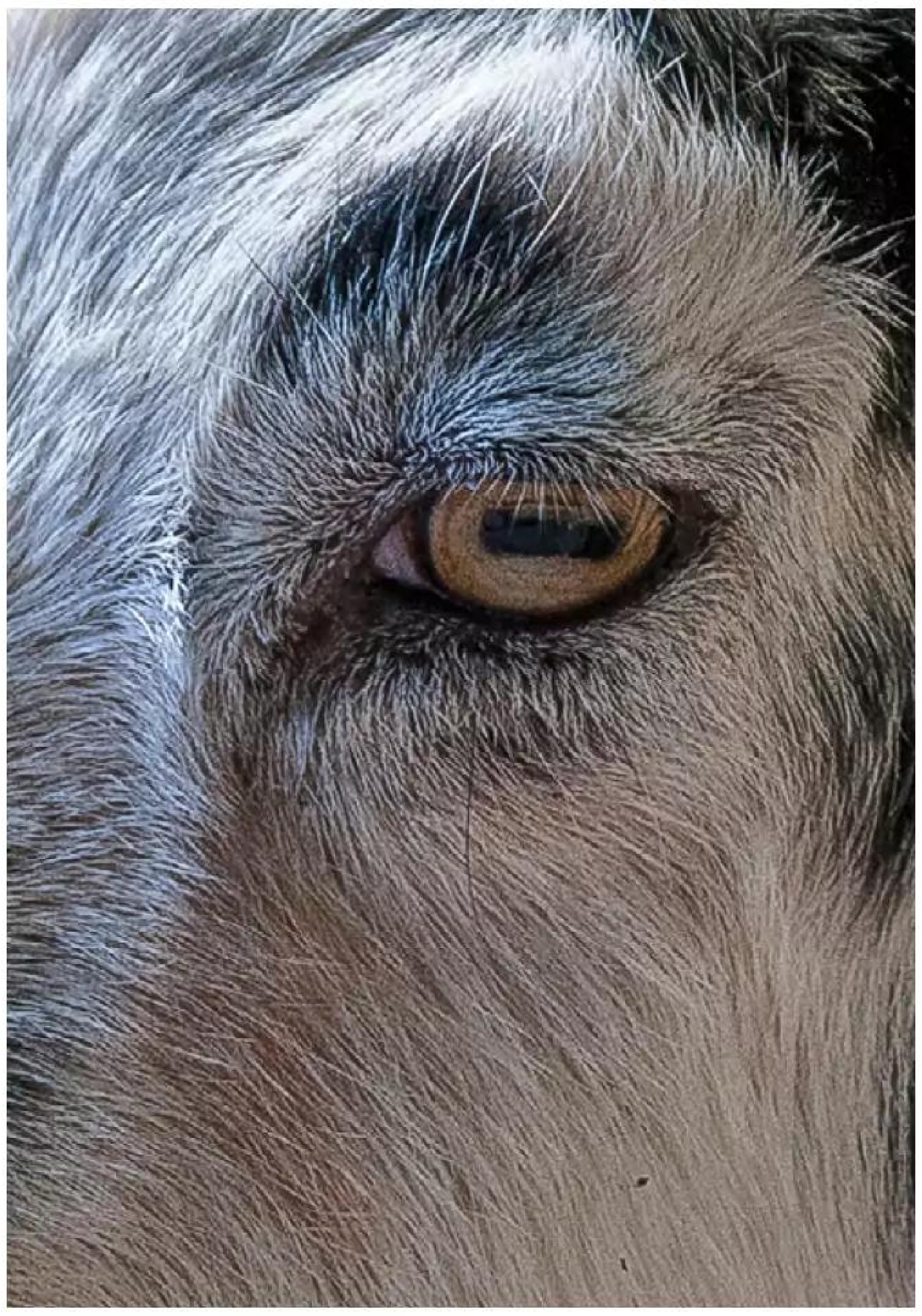
Animals are unpredictable to say the least. The best kind of wildlife photography shows animals displaying behaviour, rather than just sitting immobile. Be prepared to sit and wait, with your eye glued to your viewfinder, for something to happen. It might sound odd, but keep both eyes open whilst looking through the viewfinder. Your peripheral vision in the eye not looking through the viewfinder helps you to spot something that might happen in the wider context and you may 'see' the shot coming. Be on your guard for two baboons to start squabbling or for lion cubs to start play-fighting whilst the lioness looks on. You just never know.

This lion was far too close to the fence to avoid the criss-cross pattern of the wire being visible. In cases like this, why not just make a feature of it? An image like this might have more impact and can be more of a statement.

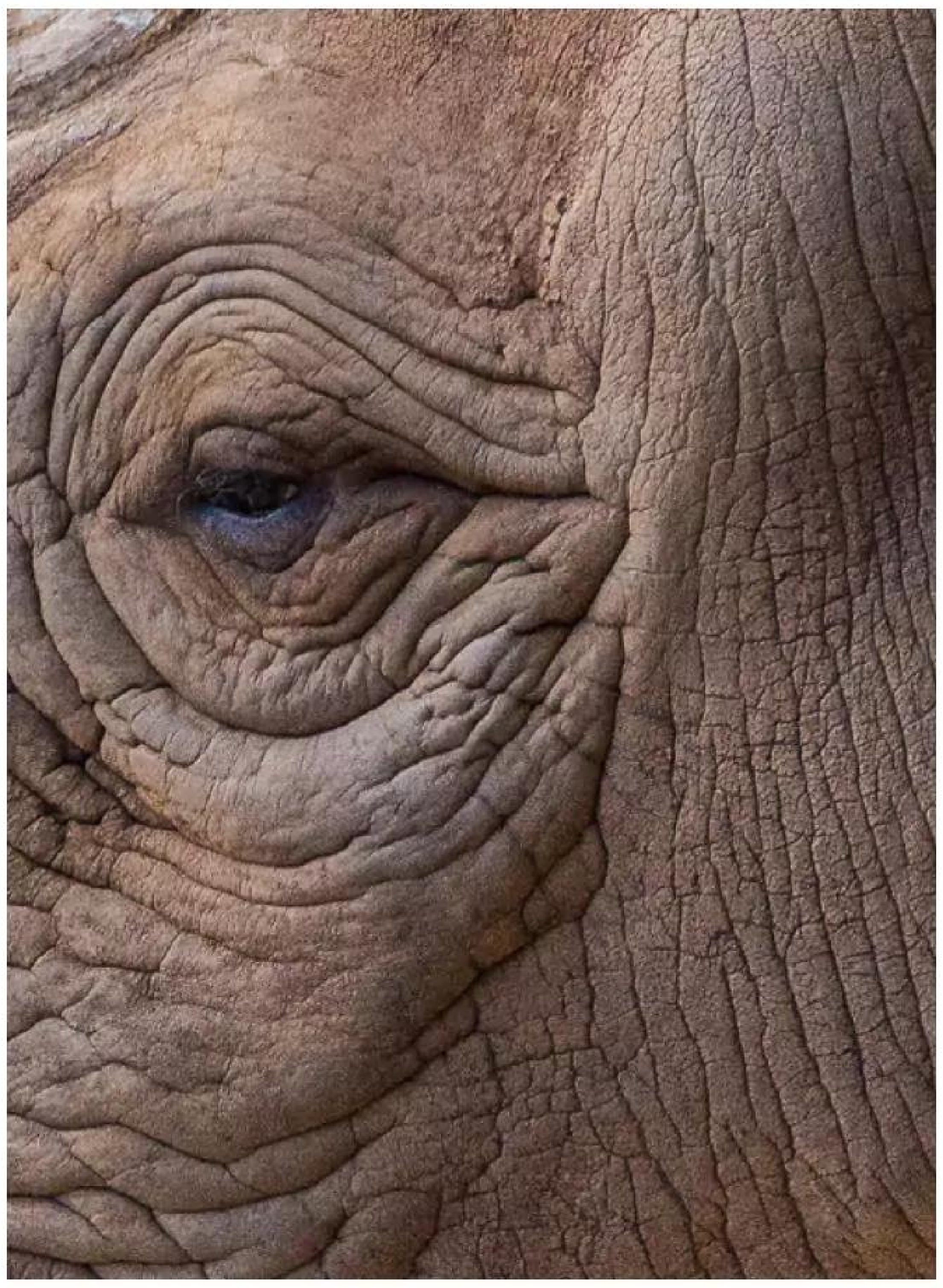
A tripod can double up as a monopod at a pinch if you are in a tight spot as shown below. Although not as stable, it will help you keep your camera a little more solid as you go for those shots where shutter speeds are too slow to enable you to go hand held.







Sometimes, no matter what angle you shoot from, there may always be some man-made object that gives the zoo environment away. In cases like that, you can also crop images very tight for a more abstract feel to remove as much of those unwanted distractions as possible.



Think fast

Most of your subjects will be moving targets. Keep your shutter speeds high and you'll eliminate camera shake. Shoot in Aperture Priority and dial up your camera ISO setting and keep your aperture at its maximum f/2.8-f/4 if you have it, and try and get your shutter speed to 1/500 or beyond. It's better to have a noisy but sharp image due to high ISO, than a completely unusable blurred image of a chimpanzee leaping from tree to tree. If your camera has a continuous shooting mode, activate it. You can shoot a small sequence of shots and stand a better chance of getting the 'moment' you were after within that sequence.

Lock on

For shooting animals in motion, focusing mode is down to your style of shooting, but a good place to start is with AI Servo mode. This mode allows you to lock an AF point on your subject, and while depressing your shutter button half way down, it will continue to track the subject as long as you keep the AF point on the subject as it moves. It can take a bit of practice, and certain focus tracking systems may not be so sensitive in low light.

Above all else, abide by the rules of the zoo, always be courteous, do not attempt to put yourself or the animals in danger in any way and be mindful of using flash that might startle the animals. Take many shots, memory is cheap, you increase your chances of nabbing a cool shot if you shoot more. Finally... enjoy your day at the zoo. ■

Assignment: The Black Rider

A photo shoot to pay homage to the Lord of the Rings

Being a photographer, you may be called upon to shoot many varied subjects. Some of them may not exactly be as exciting or creative but that is the nature of the job. Not all of us have the option to shoot in exotic locations with masses of equipment and a plethora of supermodels. In point of fact, the reverse is the norm for a jobbing photographer. You are more likely to be swapping Portofino for Portsmouth. Even though you may not be a jet-set photographer, there are times when you get to have some fun and have the chance to experiment with some great photographic and lighting techniques to deliver a finished result that the client is happy with.

The idea

Just such an opportunity came our way recently. Suzy, a close friend, is an avid horse lover and her two ponies, Splash and Baggins are her world. For some time Suzy has wanted to recreate scenes from the Lord of the Rings trilogy, incorporating the black riders. The black riders are also known as Nazgûl or Ringwraiths, the servants of the dark lord Sauron. In the first film, The Fellowship of the Ring, they chase down Frodo and his hobbit friends on horseback. Suzy wanted to fulfil an ambition to create a black rider costume and be photographed on her horse Baggins in a setting that mimicked the Shire, the home of the hobbits.

"Even though you may not be a jet-set photographer, there are times when you get to have some fun and have the chance to experiment with some great photographic and lighting techniques."

The box below contains the camera settings used for the image on this page. When you view your photos on your computer using programs like Adobe Photoshop and Adobe Bridge, these settings are displayed. Look out for more boxes like this in our guides throughout the creative projects section.

f/ 8.0 1/160

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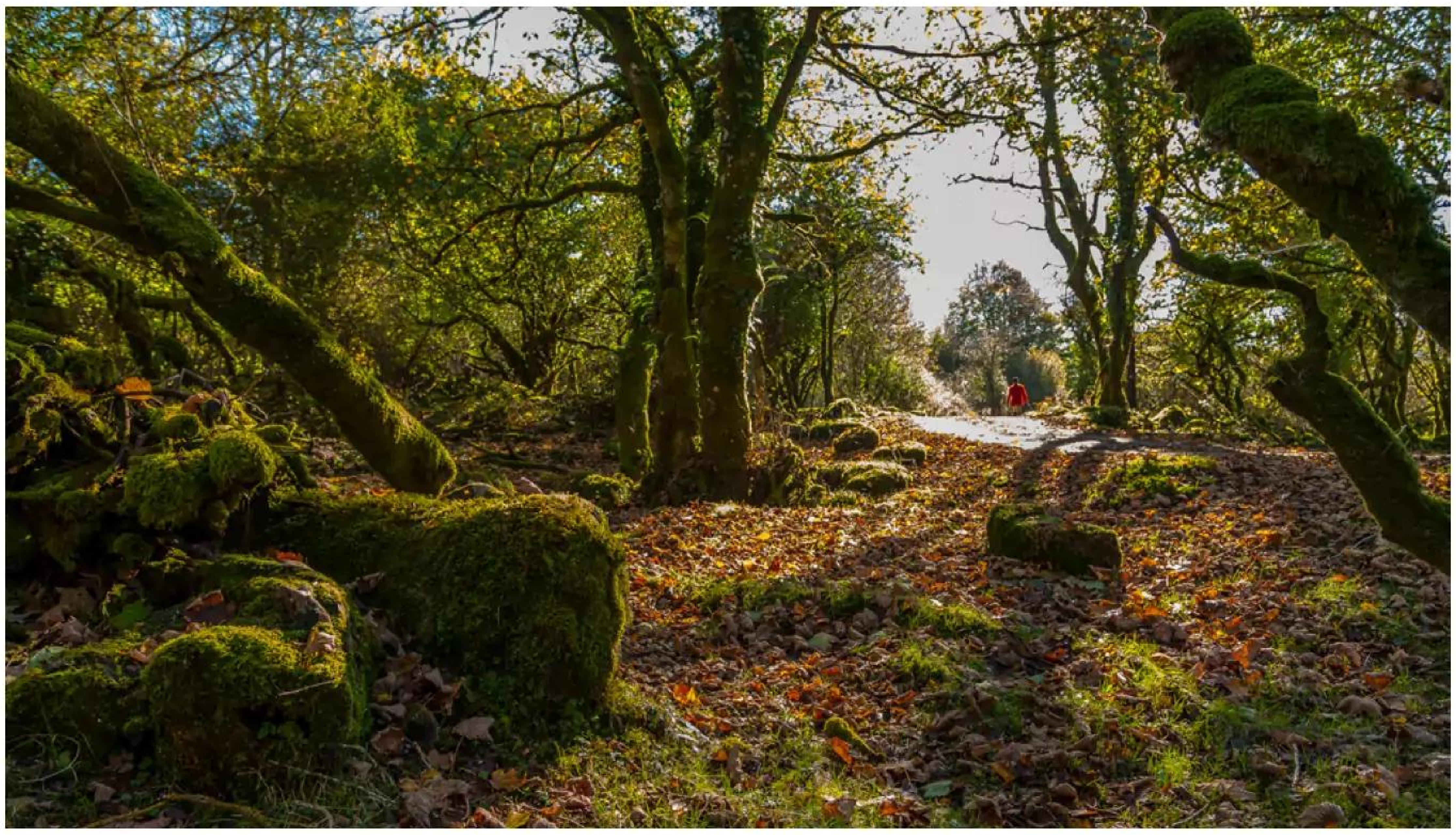
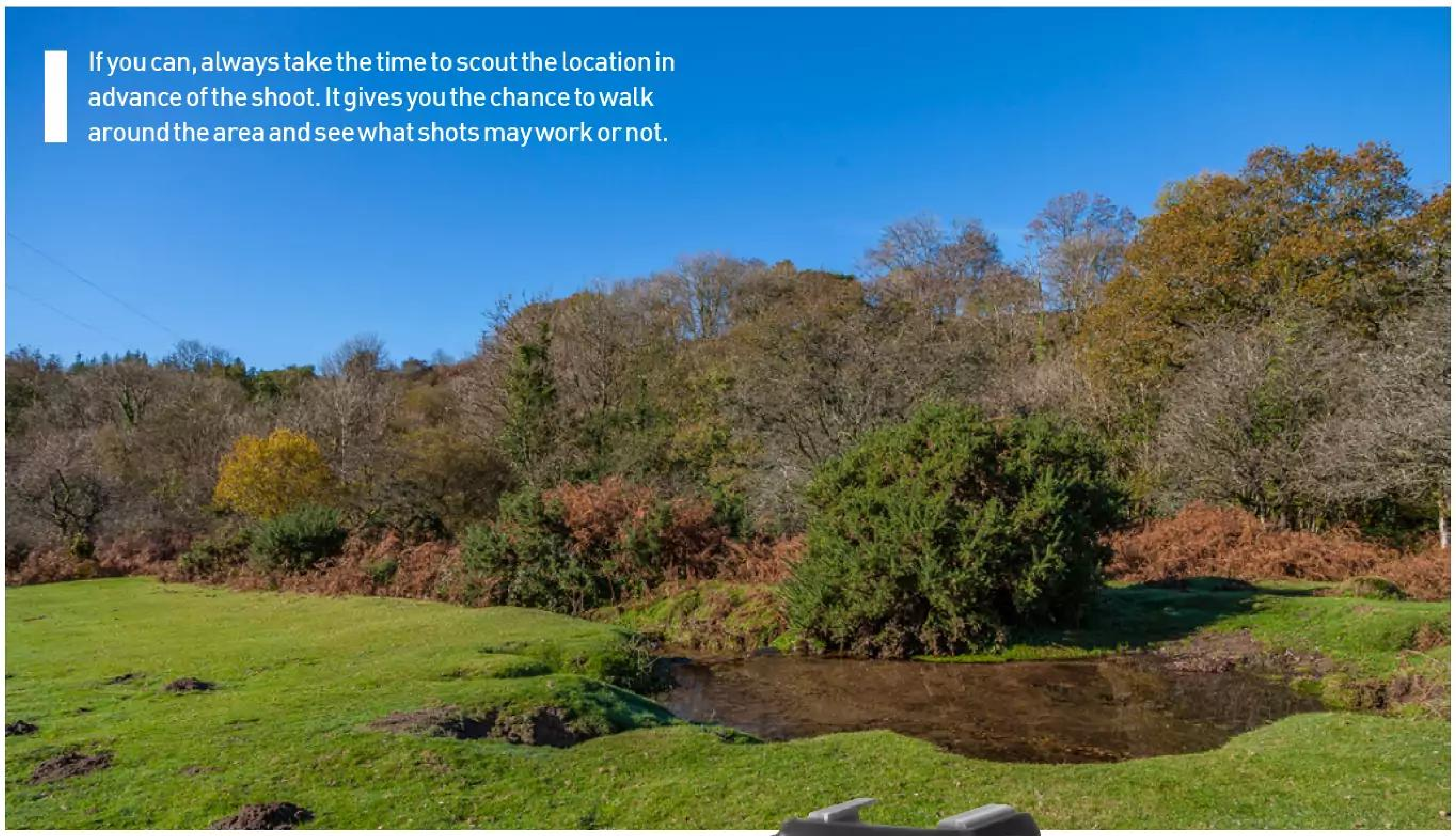
ISO 50

Next step

The first order of business was to scout possible locations. It makes a lot of sense to reconnoitre a location to be certain it works for your particular requirements; just turning up somewhere and trusting to luck is a recipe for disaster. We brought a camera and took a number of test shots and arrived at three or four possible spots that could serve as dramatic backdrops to the scene. It was also a chance to check that Suzy's horse could manage the terrain of the chosen locations. What was also useful, was the chance to talk through ideas and poses for the shoot that she wanted and also what else we could try. The primary shots would be of Suzy, in costume, atop Baggins but there was also some scope to do some portrait work of the Ringwraith character on its own. We shortlisted the shots we wanted to try and made that our starting point when we came to do the shoot. There were wooded areas with a stream running through that were close to the stables where Baggins is kept that meant we weren't having to hack across large distances to each location, so we had more time to play with ideas.

Baggins had been photographed with flashguns before and we knew that she had no aversion to them. They had been introduced slowly and gently with some very low power test flashes so she had time to get used to these strange devices. This is a key consideration when photographing animals: you will need to check that the animal is comfortable with the flashguns. It isn't necessarily the pulse of light itself that can spook an animal, sometimes the 'pop' of the flashgun can be enough to unsettle them.





If you can, always take the time to scout the location in advance of the shoot. It gives you the chance to walk around the area and see what shots may work or not.

The location shoot was done with a 24-205mm zoom lens [1] teamed with a canon 5DMK3 [2]. It quickly became apparent that the wider 16-35mm lens [3] was going to be a much better option in tight shooting situations.

1
Canon
24-105mm
IMAGE STABILIZER
ULTRASONIC

2
Canon
EOS 5D
Mark III

Camera and lens

The benefit of bringing a camera along to a location scout is it gives you a better feeling for what focal lengths will work for the shots you are trying to achieve. Assuming it would cover all the bases, we took a Canon 5DMK3 DSLR and a 24-105mm lens. We quickly realised that in our chosen locations, we would be working at close quarters with our subject Suzy and her horse. Even at the short focal length of 24mm, we were going to struggle to get the shots framed with enough background left over to make an interesting composition. It was going to require an alternative lens of 16-35mm to give us a wide enough angle of view to make the shots work.

Lighting the shots

The lighting we wanted to use was not going to rely on available light in the scene at the time of shooting. We were going to use a technique that involved the use of flash lighting to illuminate the subject whilst deliberately underexposing the background. This can create quite a strong and slightly surreal look that we hoped would match the subject matter more, rather than just shooting in plain daylight. The only issue we faced was just what kind of weather we would be working with on the day of the shoot. Our hope was that the day we had chosen would be overcast since it meant that we would have to use less flash power to underexpose the background and still be able to light our subjects. It also meant that the shots would be more dramatic if we had dark rolling clouds as a backdrop. However, the day of the shoot dawned and it was a perfect blue sky day.

Flashguns like the Canon Speedlite are perfect for mobile shooting situations. There may be times however, when they just aren't powerful enough for your needs.

640 WS
B1600
ALIENBEES

For cost-effective portable lighting with enough power to do the job, the AlienBees B1600 is a great workhorse.

We have the power

The original intention was to use a couple of flashguns to light the subject. Now we had to rethink since to significantly underexpose a bright sunny day would require narrow apertures, the lowest ISO setting the camera could manage and a shutter speed that was as fast as possible without exceeding the sync speed of the flashes. The sync speed is the fastest shutter speed you can use where the camera's entire shutter is open at once and not partially covered by it when the flash fires. Otherwise you will see black bars in your photo and it will be ruined.

Although the background was meant to be underexposed, we still had to be able to provide enough illumination on Suzy and her horse to light them correctly, otherwise we would just have series of very dark shots. That meant the flashgun option was not viable. Good though they are, modern flashguns do not have enough power for this kind of situation unless you have a lot of them firing together or can get the flashes very close to your subject. We were going to be working with a horse and that meant we needed to have the lights at a reasonable distance from her in case she moved unexpectedly.

We needed to turn to a more powerful option. In this case, we brought our portable studio flashes with us. They can be powered by lithium battery packs that can provide about 250 full power flashes. These studio lights are much more powerful than a flashgun and we were going to use two of them controlled by a wireless trigger mounted on the camera.

3/4+
1/2
1/4
BATTERY
30A FUSE
CHARGER
230VAC 50HZ PURE SINE WAVE
VAGABOND MINI™
LITHIUM
Paul C. Buff, Inc. • Nashville • Made in USA
USB .5A

Although not cheap, the lithium power packs for the B1600 can keep you shooting for up to 250 full-power shots.

3
16-35mm 1:2.8 L
ø82mm
CANON ZOOM LENS EF 16-35mm 1:2.8 L II USM
16-35mm
16 20 24 28 35

Setting up

We arrived at the location and Suzy made Baggins ready and then got into costume. It was then a case of trotting down to the first location to get the settings and lights dialled in so we could get shooting. Rather than subjecting Baggins to a battery of test flashes, the lights were set up before the horse arrived. We used one of our party as a stand-in to get the lights and camera ready.

The first order of business was to set the camera up to underexpose the ambient light. We deliberately chose a shaded area so we wouldn't have to be working in full bright daylight to give ourselves a chance. We were using a Canon 5DMK3 with the EF 16-35mm f/2.8 L series lens. The 5DMK3 is a fairly old camera now but it still delivers quality 22MP images. The lens is a great wide-angle zoom which would let us get quite close to the horse but still be able to get a lot of background into the scene at the same time at the shorter focal lengths. Our preference is to shoot with our settings in full manual mode and in Raw format. After a bit of trial and error we had the camera set up. Aperture was f8, ISO was 50 and shutter speed was 1/200s. This is the 5D's max sync speed with the studio lights we were using. These settings were enough to darken the scene by a significant amount. Now we needed to fire up the lights.

Lighting

The lighting setup was going to be very simple. The subject would be placed between the two studio lights and cross-lit. One light would have yellow gel placed over it to create some nice coloured rim lights on one side and general lighting coverage on the other. It quickly became apparent that at the distance the lights were from the horse and rider, they would both have to be on full power to illuminate them properly based on the camera settings used to darken the ambient daylight. Luckily, the lights are designed to be able to shoot at full power for extended periods. They have built-in cooling fans to prevent overheating. All we needed now was for Suzy to manoeuvre Baggins onto the shot. Horses can be wilful animals and Baggins would not always comply and stand where required. This wasn't too much of an issue since our lights were portable and we could quickly jockey them into different positions to suit the situation. Now we could shoot.

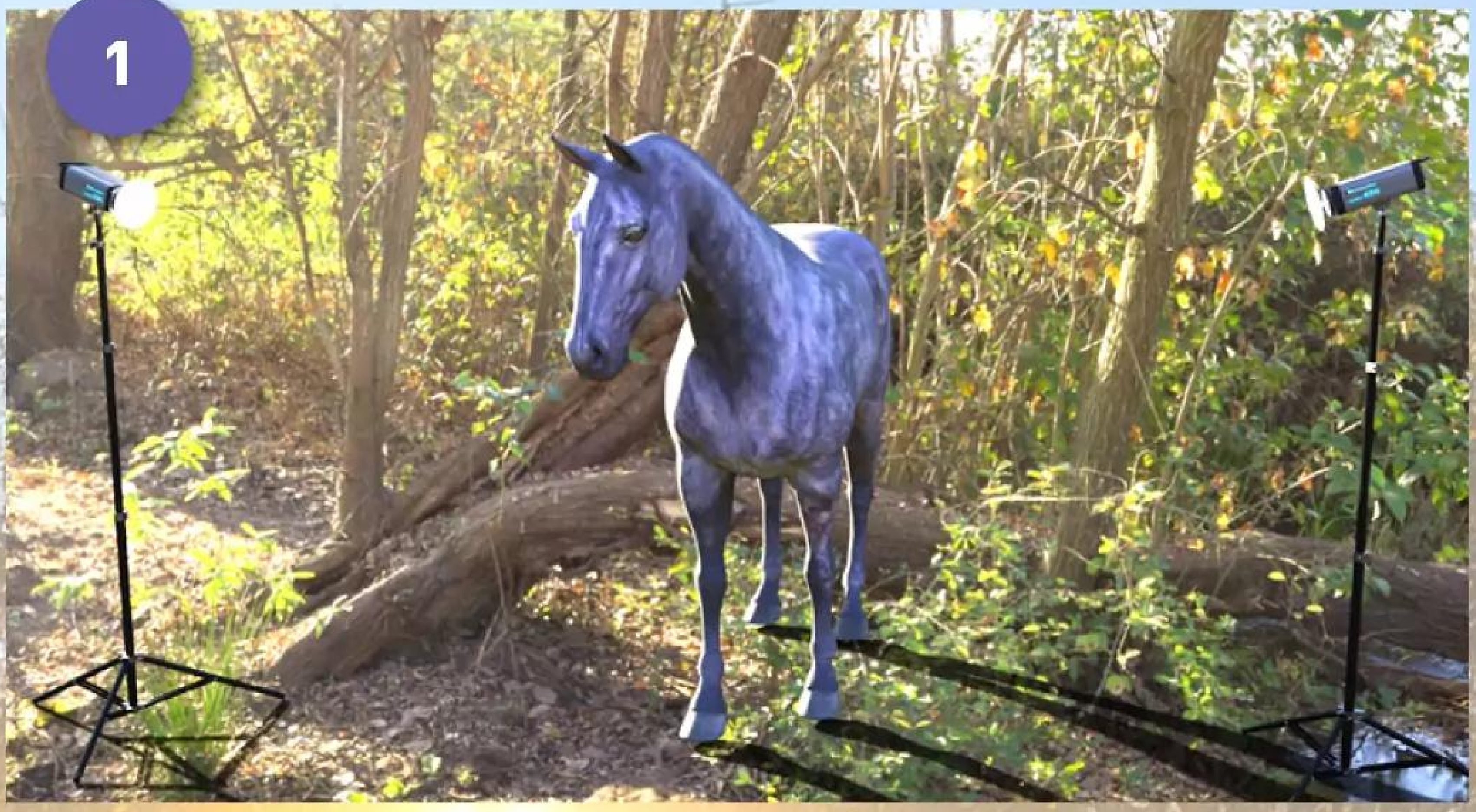
Shooting

When dealing with a large animal like a Dartmoor pony, you have to work quickly and carefully. You also need eyes in the back of your head. If the animal decides it's had enough and wants to move off, it's going and you can't do much about it. Suzy would get Baggins into position and we would try and nab some shots, then she would move and the lights had to be repositioned each time. It's a process and you just have to go with it. Luckily, Baggins was fairly compliant that day and we achieved a number of setups, done in a couple of locations. There was also a stream nearby and we had a go at setting up a shot there. Baggins immediately decided to start stamping her hooves in the water and it looked great, there was a concerted rush to frame the shot, get lights into position and shoot while the horse was stamping at the water. We took a few before she got bored! We also did a number of shots without the horse in the scene, concentrating on doing some Nazgûl portraits in a couple of locations as well. All too soon the battery packs started flashing warning lights at us to let us that our shoot was coming to an end. It was okay though as we were confident we had a number of good shots in the bag.

The day was an excellent example of collaboration and some problem solving too in order to get the shots in the time we had.

Below is a rough illustration as to how the shots were made. Image [1] is what a normal exposure would have looked like with no alterations to settings for the bright conditions we were working in. Image number [2] shows the first part of the process. The camera's settings have been deliberately altered to underexpose the scene by about two stops, making it look quite dark. Image [3] gives an indication of how the first flash, to the right of the subject reintroduces light into the scene, but can now be controlled by the photographer rather than relying on ambient light. This flash is at full power. The second flash to the left of the subject [4] is covered with a yellow gel. At the angle we were shooting, it creates a bright rim light effect on the left side of the horse and helps to pick it out from the background. All the shots done that day were using variations of this setup.

1



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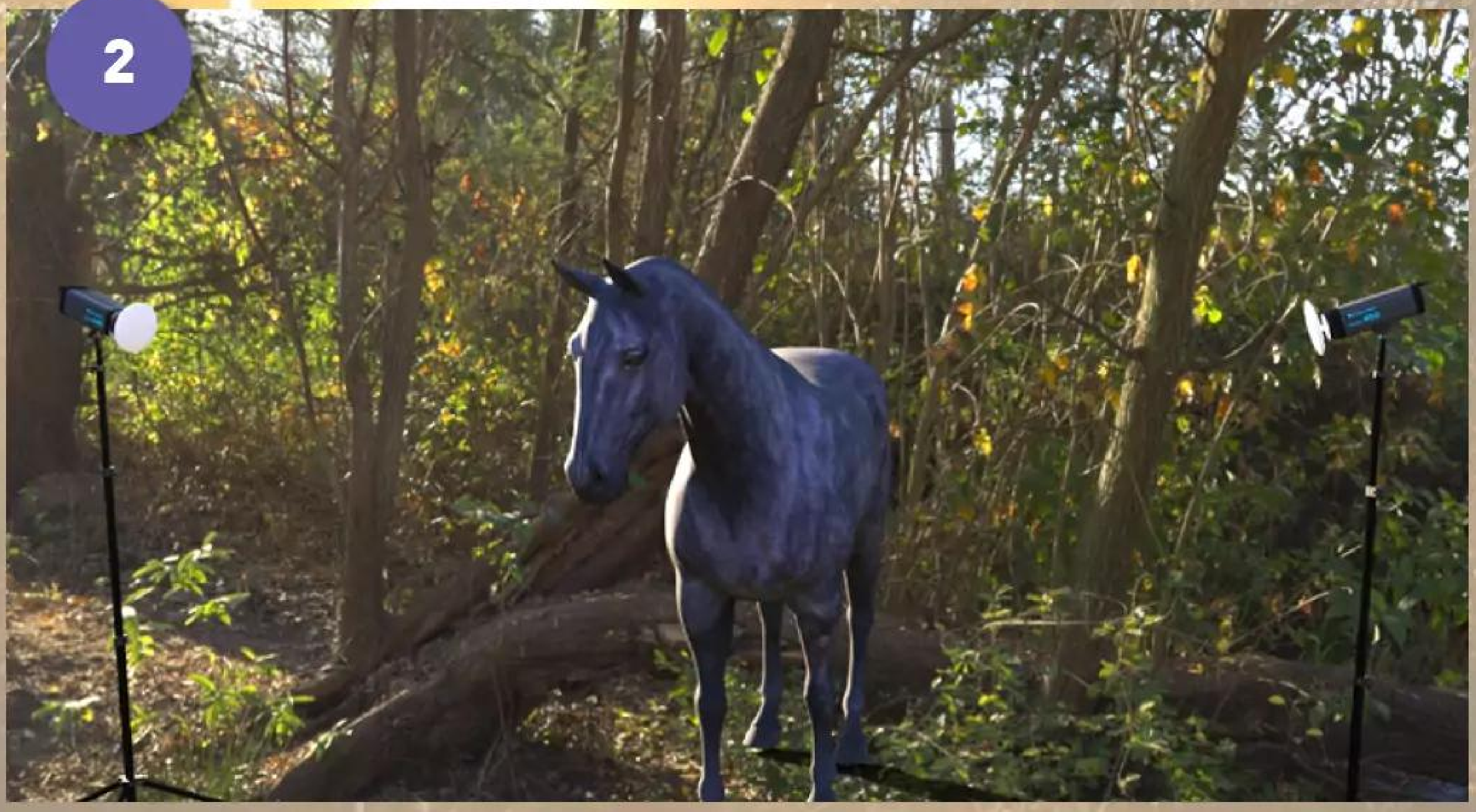

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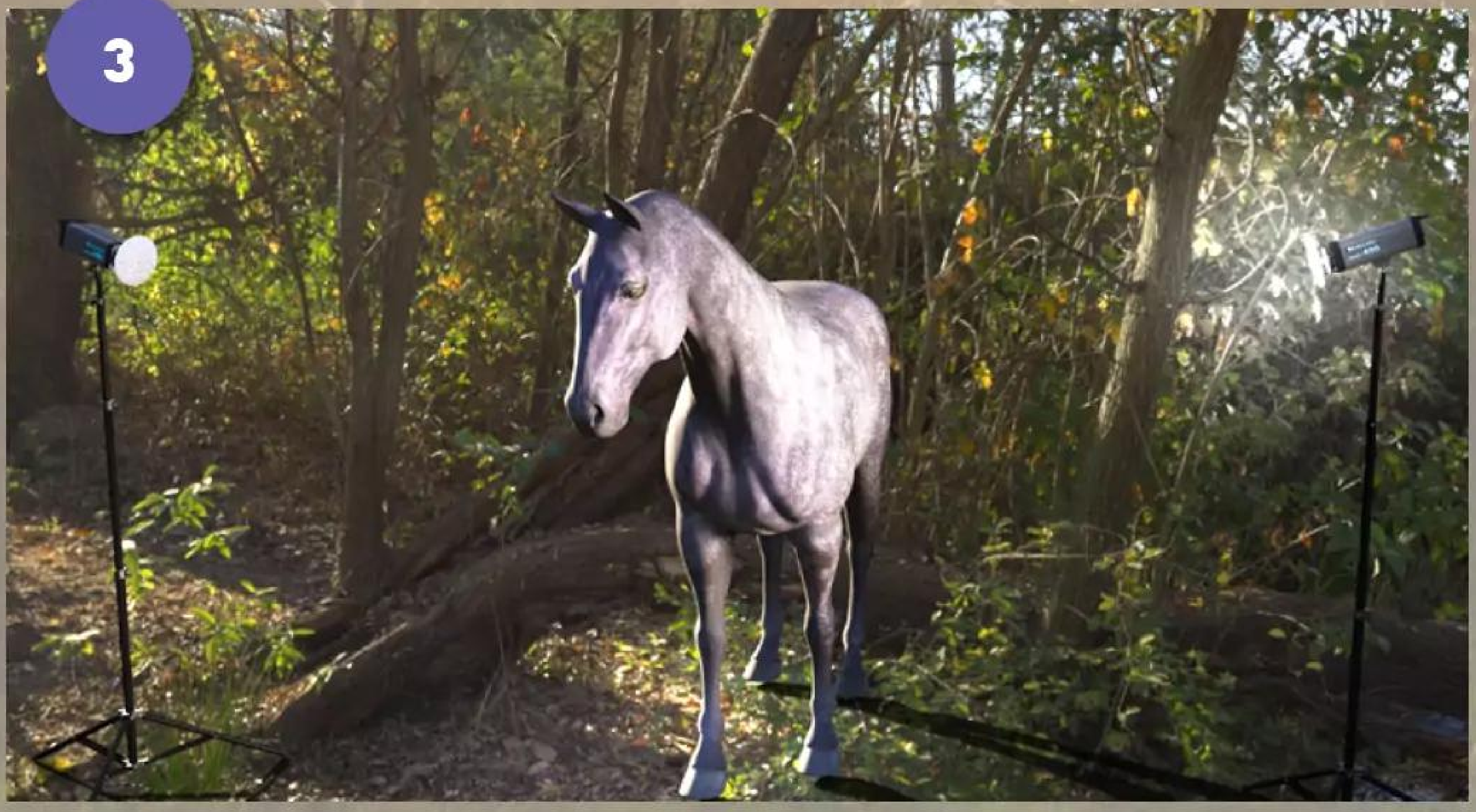

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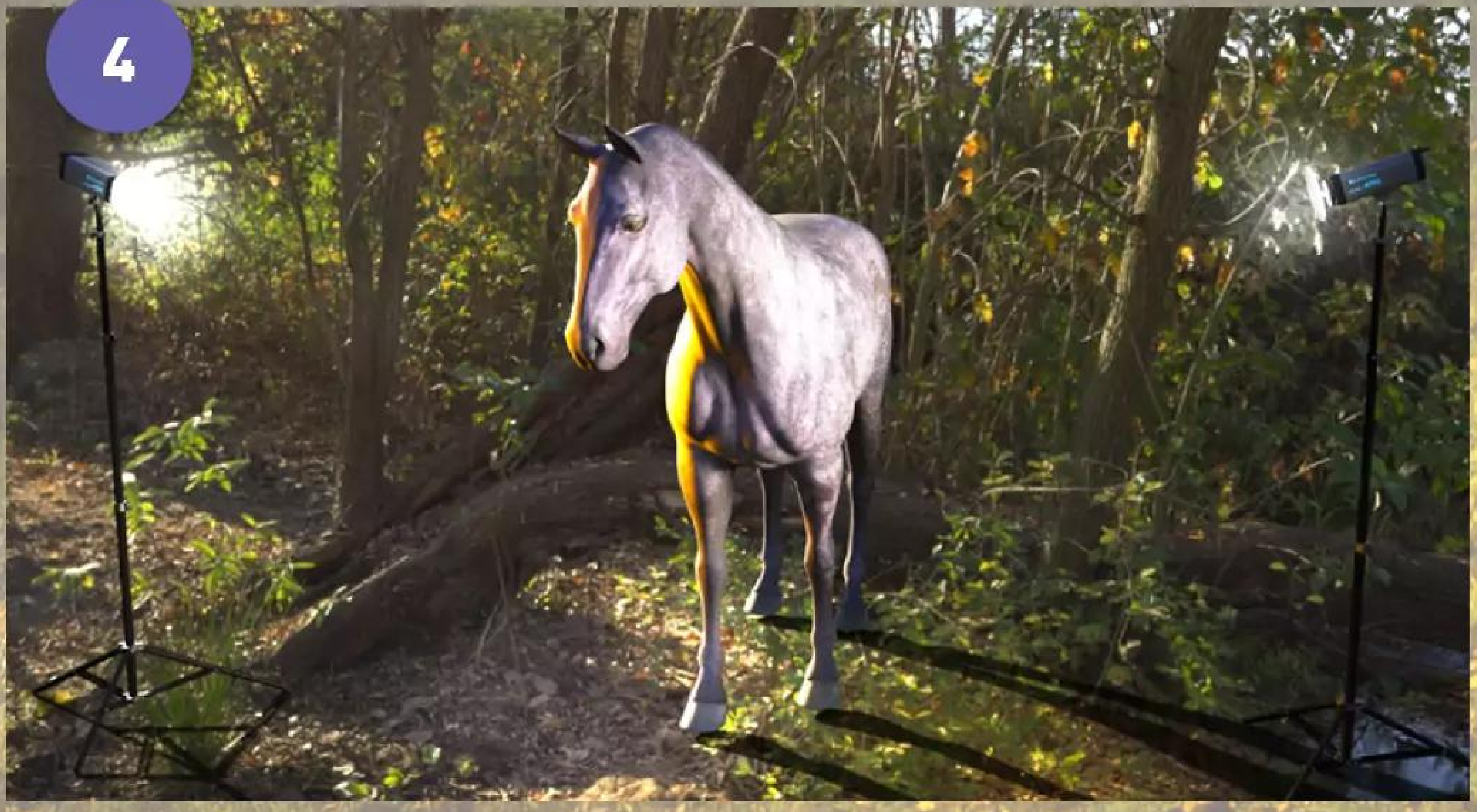
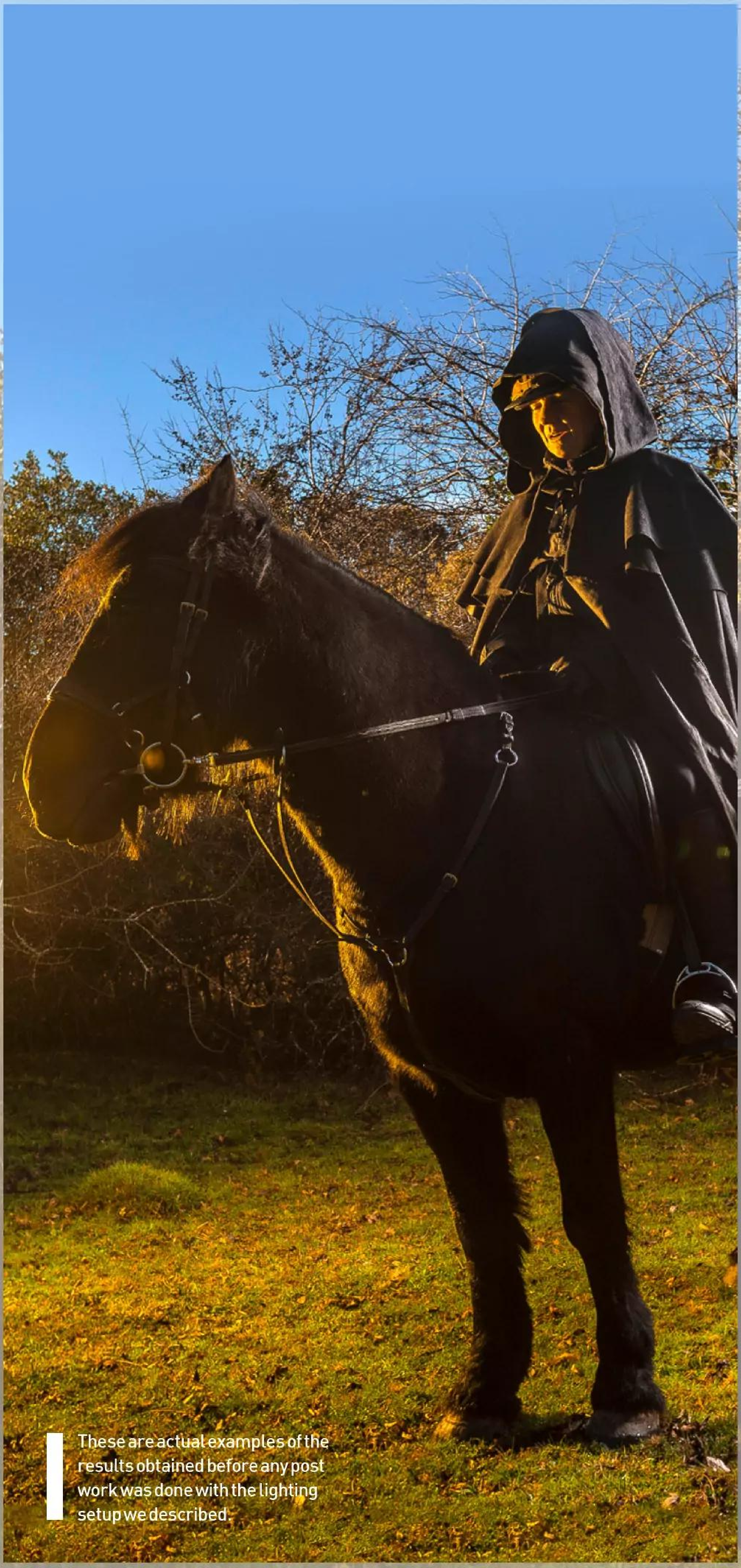
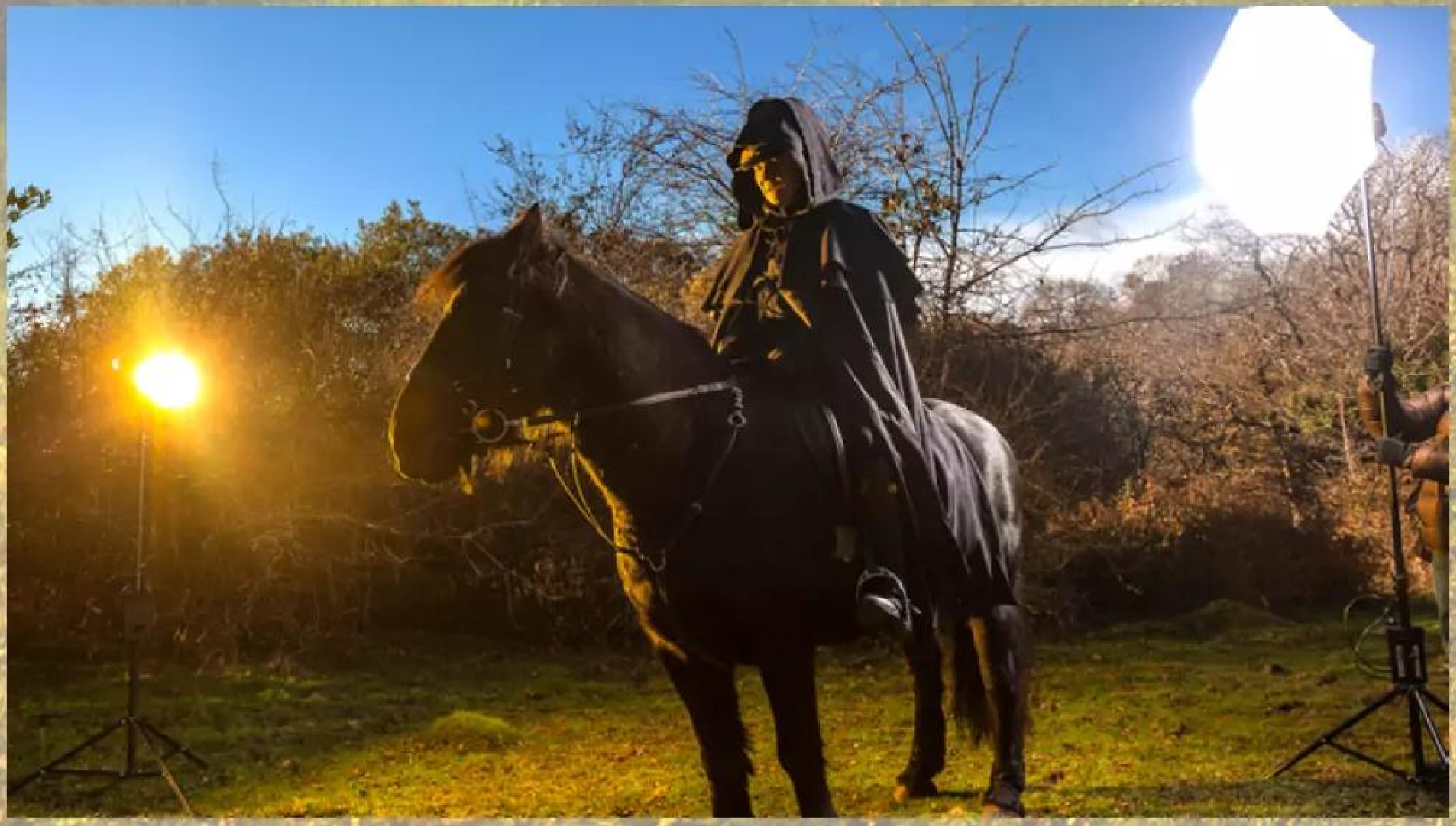
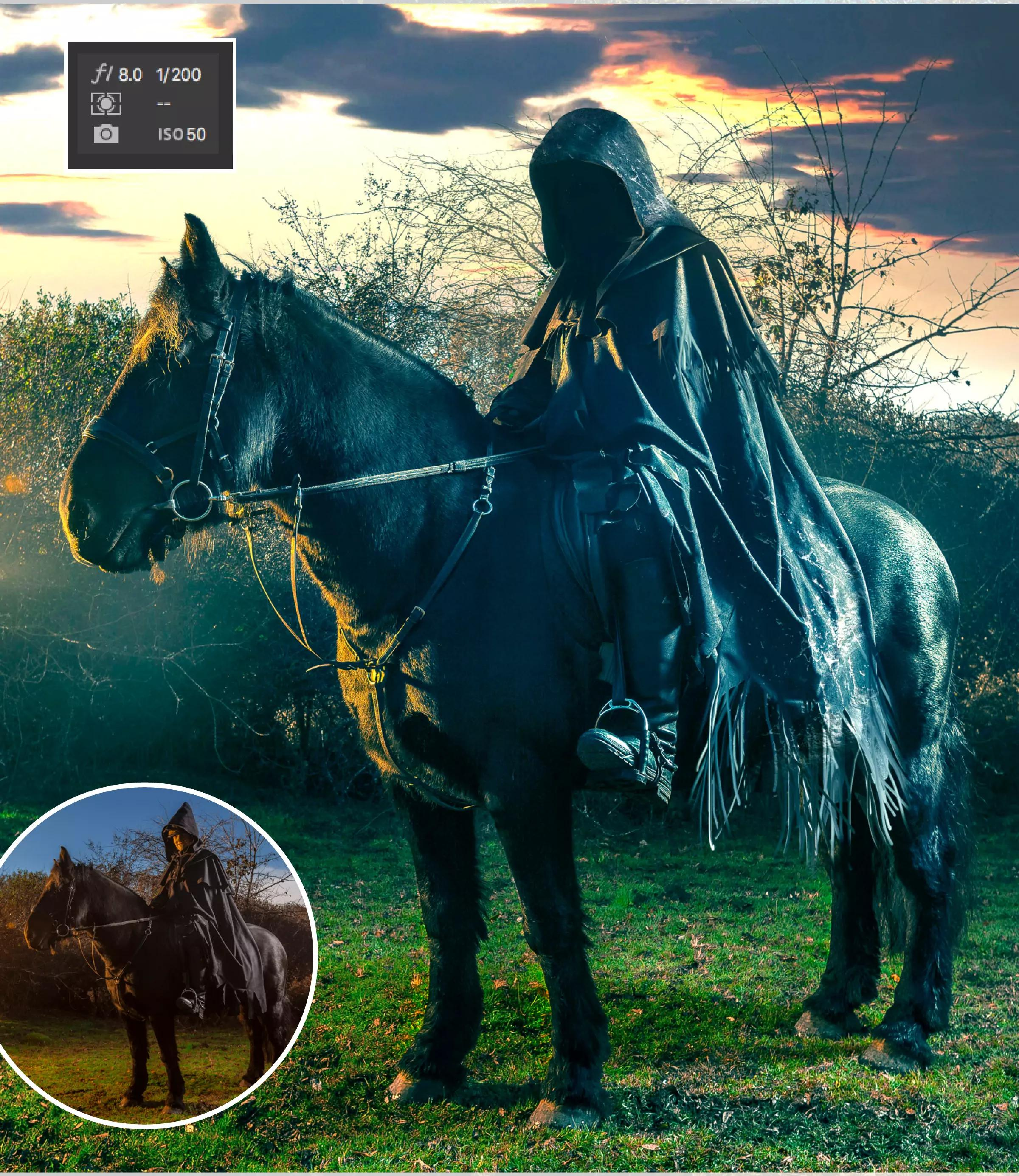






These are actual examples of the results obtained before any post work was done with the lighting setup we described



f/ 8.0 1/200

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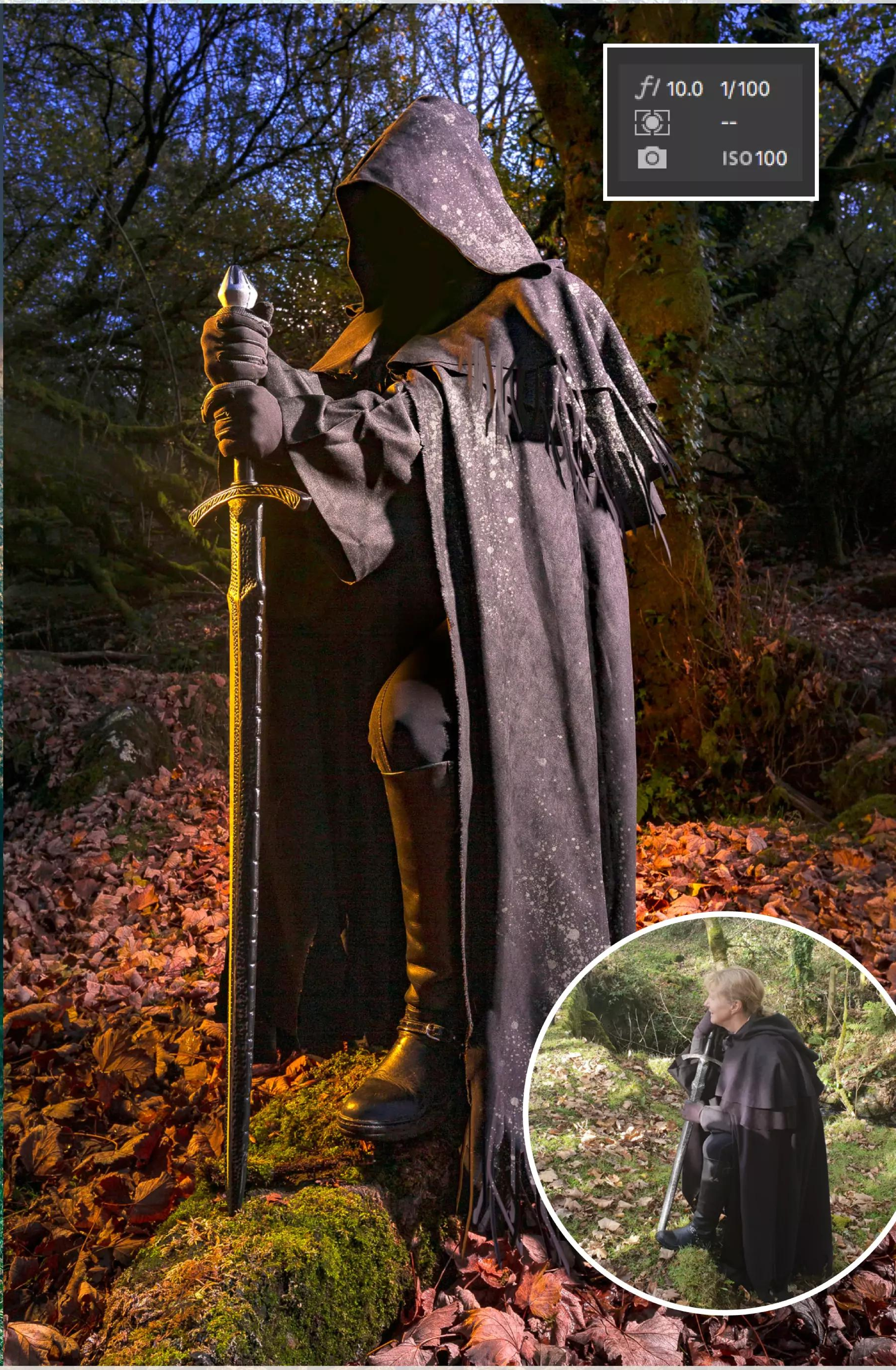
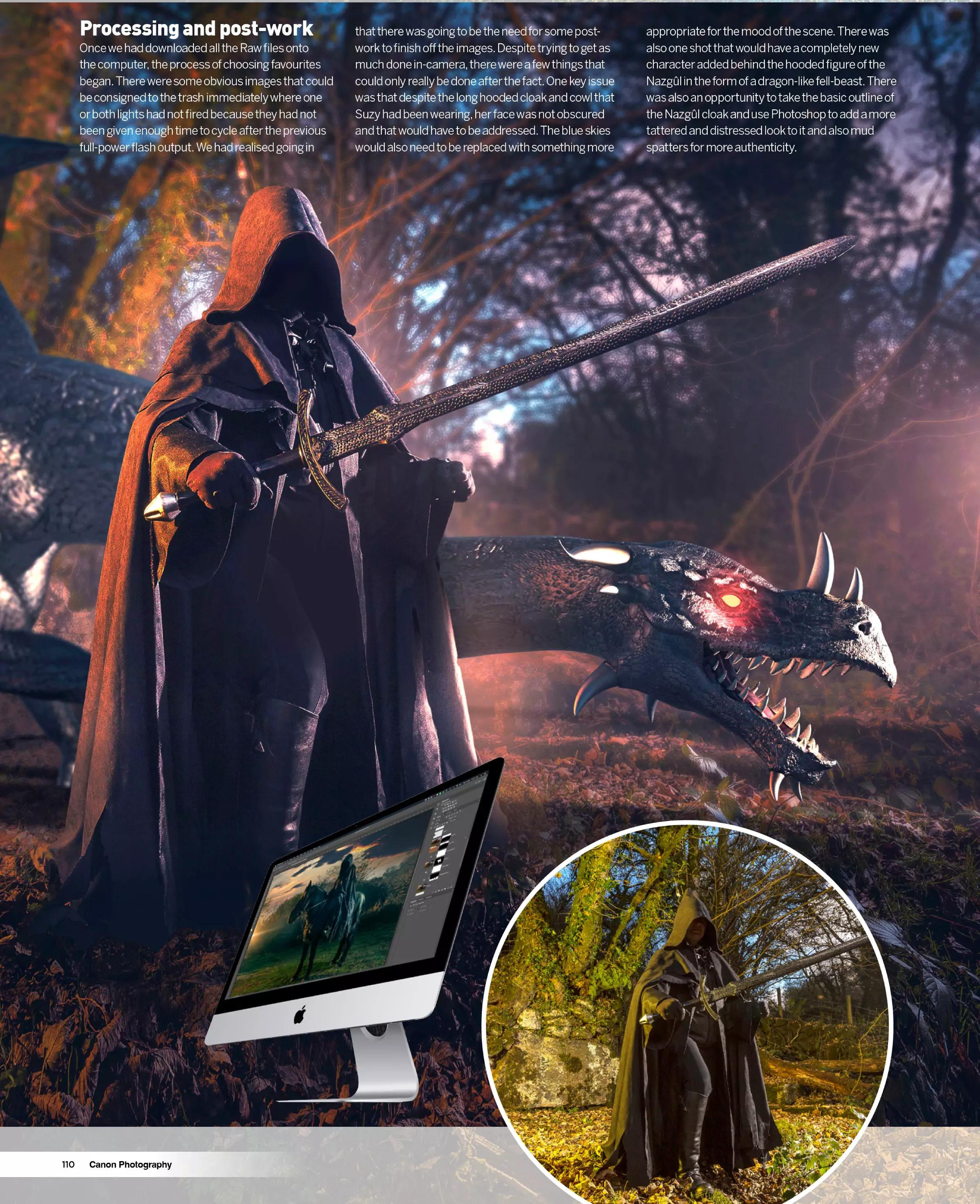
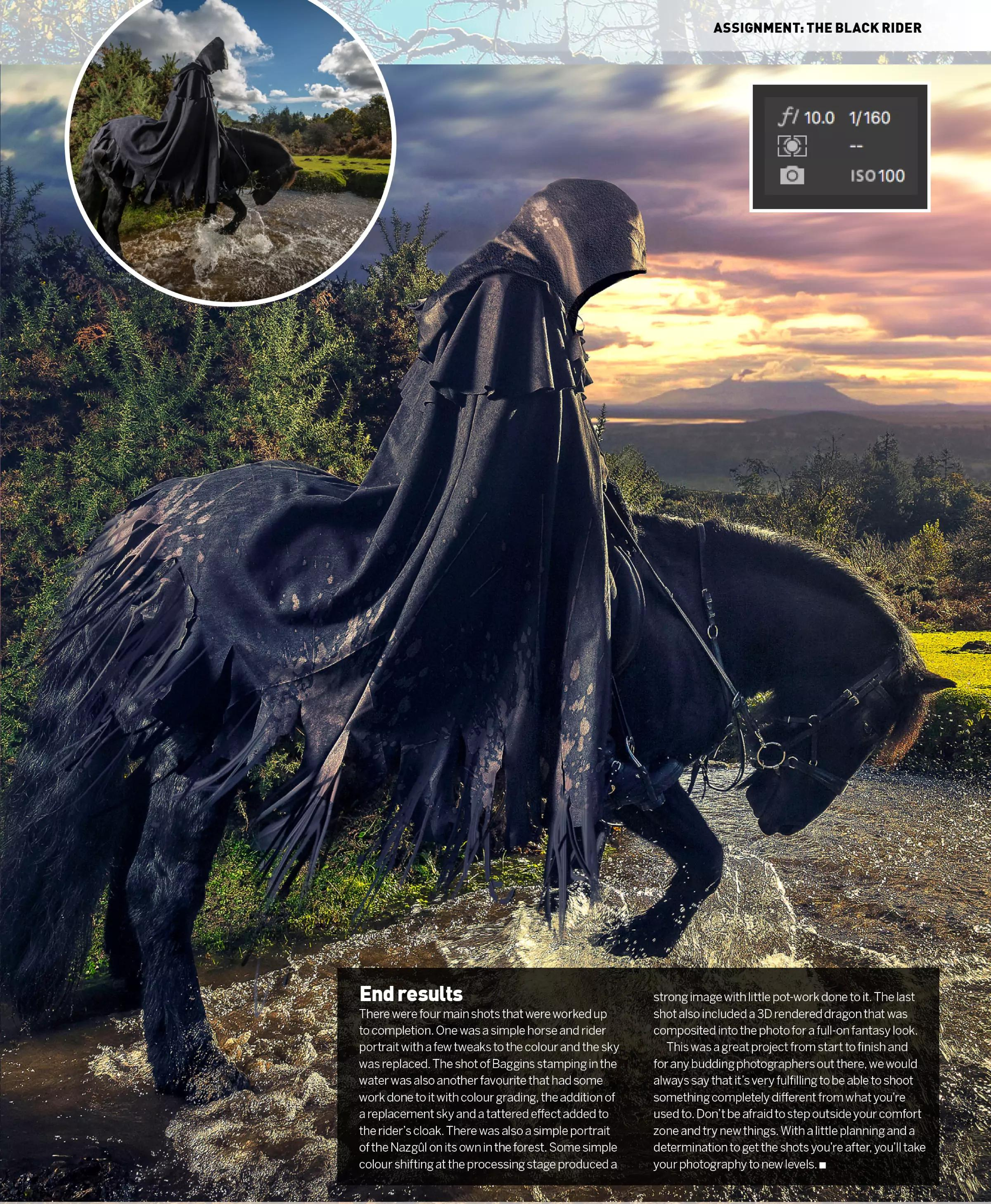
ISO 50


f/ 10.0
1/100
--
ISO 100

Processing and post-work

Once we had downloaded all the Raw files onto the computer, the process of choosing favourites began. There were some obvious images that could be consigned to the trash immediately where one or both lights had not fired because they had not been given enough time to cycle after the previous full-power flash output. We had realised going in that there was going to be the need for some post-work to finish off the images. Despite trying to get as much done in-camera, there were a few things that could only really be done after the fact. One key issue was that despite the long hooded cloak and cowl that Suzy had been wearing, her face was not obscured and that would have to be addressed. The blue skies would also need to be replaced with something more appropriate for the mood of the scene. There was also one shot that would have a completely new character added behind the hooded figure of the Nazgûl in the form of a dragon-like fell-beast. There was also an opportunity to take the basic outline of the Nazgûl cloak and use Photoshop to add a more tattered and distressed look to it and also mud spatters for more authenticity.





ƒ/ 10.0 1/160

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ISO 100

End results

There were four main shots that were worked up to completion. One was a simple horse and rider portrait with a few tweaks to the colour and the sky was replaced. The shot of Baggins stamping in the water was also another favourite that had some work done to it with colour grading, the addition of a replacement sky and a tattered effect added to the rider's cloak. There was also a simple portrait of the Nazgûl on its own in the forest. Some simple colour shifting at the processing stage produced a strong image with little pot-work done to it. The last shot also included a 3D rendered dragon that was composited into the photo for a full-on fantasy look.

This was a great project from start to finish and for any budding photographers out there, we would always say that it's very fulfilling to be able to shoot something completely different from what you're used to. Don't be afraid to step outside your comfort zone and try new things. With a little planning and a determination to get the shots you're after, you'll take your photography to new levels. ■

Enhance your photography

A word about using filters and why they are still so useful

As your photography skills increase and you delve deeper into the techniques available, you are very likely to encounter words like Neutral Density Filter, Graduated Filter and Polarising Filter. Filters, in this case, are not the kind of effects you add in Instagram at the touch of a button, these are physical items that are attached to your lens to alter the incoming light that is hitting your camera's sensor. Don't think of these filters as somehow being old-fashioned and just opt to do it all in post, filters are still a very relevant aspect of your photography skills and techniques and that's why we wanted to introduce a few of them to you and give you an idea of what they can do.

The idea of shooting a well-balanced exposure and getting it as perfect as possible in-camera is a skill worth pursuing. There are a number of filters that produce effects which are difficult, if not impossible in some cases, to reproduce in Photoshop. We would always encourage any photographer to consider trying to achieve more in-camera at the time of shooting, while discovering what a pleasure it can be to get more hands-on with the photographic process when you are actually out in the field. ■

> "The idea of shooting a well-balanced exposure and getting it as perfect as possible in-camera is a skill worth pursuing."

A Cokin filter holder for square filters can be attached to any lens with an adaptor ring.

Although modern optical coatings for digital lenses have surpassed Skylight and UV filters, they can still be your front-line defence against dirt and moisture.

Filters essentially come in two flavours: round and square. The round ones are threaded and screw directly onto the front of your lens, if you have a lens with an 82mm diameter you will need to purchase a round filter with the same dimensions. This can be a bit tricky if you want to use other lenses with different size screw threads, as it would mean buying more than one size of the same filter, which could get very expensive very quickly.

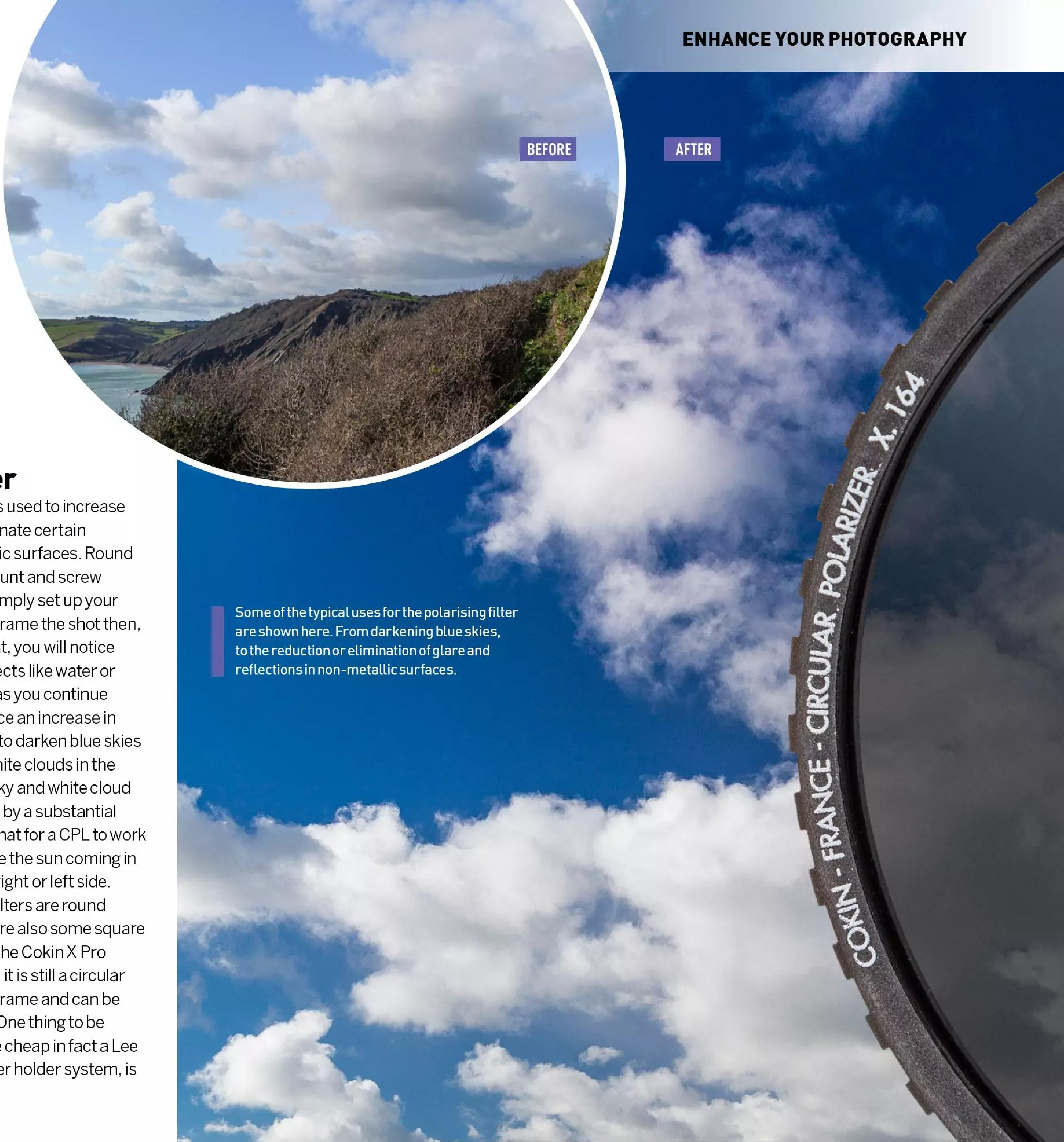
The alternative is to purchase a square filter system, this comes with a filter holder which screws onto your lens and if you have several different size lenses you can get adaptor rings for attaching the holder to any lens you want to use. The square filters, which the holder uses, are all the same size so you only need to buy one filter of any given type. There are plenty of manufacturers out there making both round and square filter systems. Lee, Cokin, Hoya, Kenko, Benro and Kase are some of the more well-known and popular systems, but there are any number of cheaper alternatives. Be aware though, if a filter or filter system from an unheard of company appears to be very inexpensive, it probably means that the filters are made from sub-standard materials, often they are made from cheap plastic and a filter that is meant to be colour neutral is in fact, anything but.

We love using filters when out on a landscape shoot, they can transform your images and it's very freeing not to be shooting with Photoshop firmly in mind for the end of the image-capture process. Why not get out there, go old school and get some filters in your life? Here's a list of some we think you should have in your kit bag.

The UV and skylight filter

The skylight filter has a very subtle pink tint to it, which was originally created to reduce the blue cast found in colour film stock and both the UV and skylight filters are also designed to filter out a certain amount of ultraviolet light in an attempt to reduce haze. These days, with the advent of digital cameras, the need to correct the blue cast no longer exists and many modern lenses have special coatings that can do the same job as these filters, so why have them at all?

The truth is, they are now mainly used to protect the front element of your lens from the ever-present danger of contamination due to dust and dirt, as well as to safeguard against scratches, better to scratch a cheap UV filter than ruin a lens worth hundreds or even thousands. Since their main function is the protection of your lens, round screw-on UV and skylight filters are the best option here.

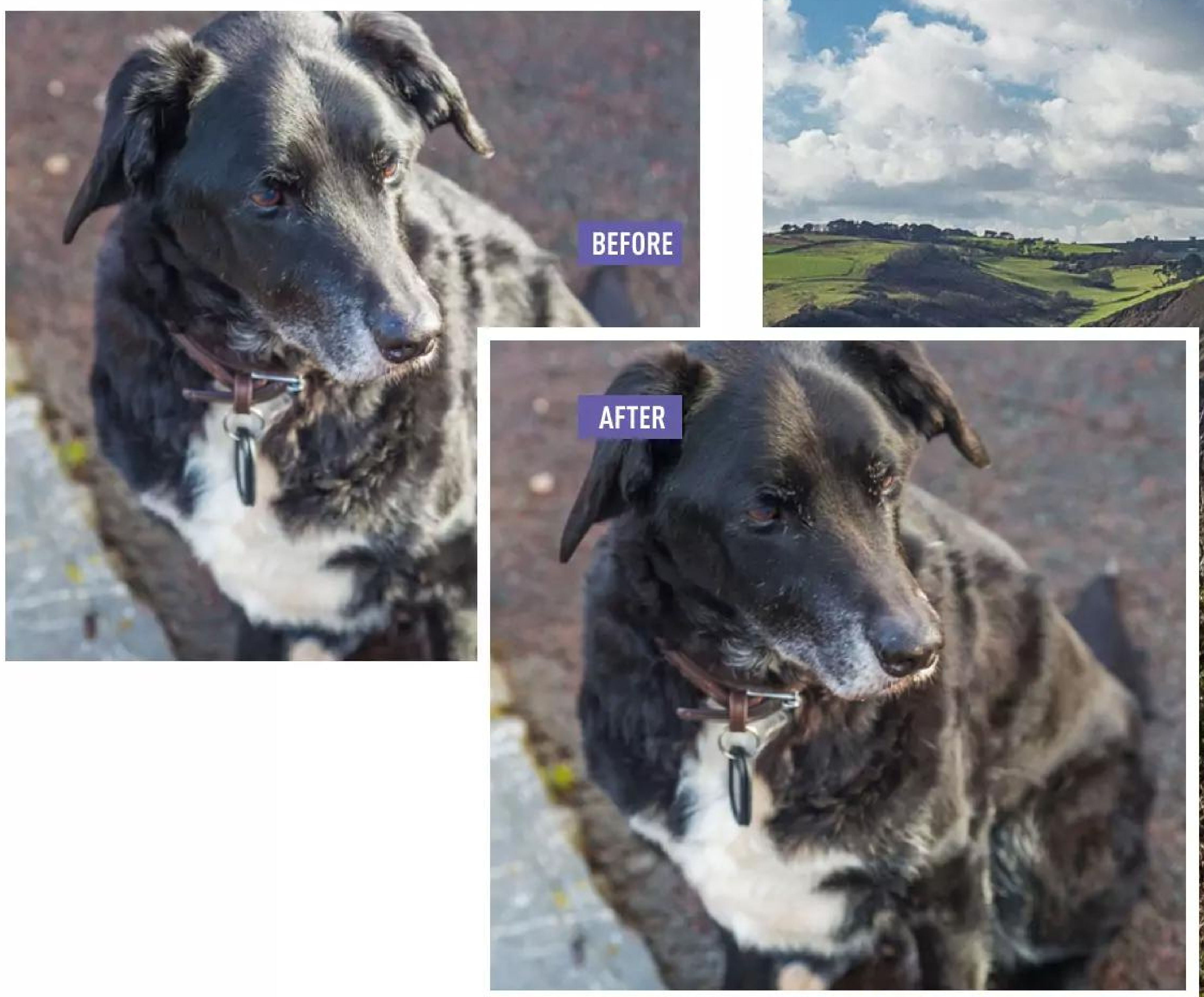


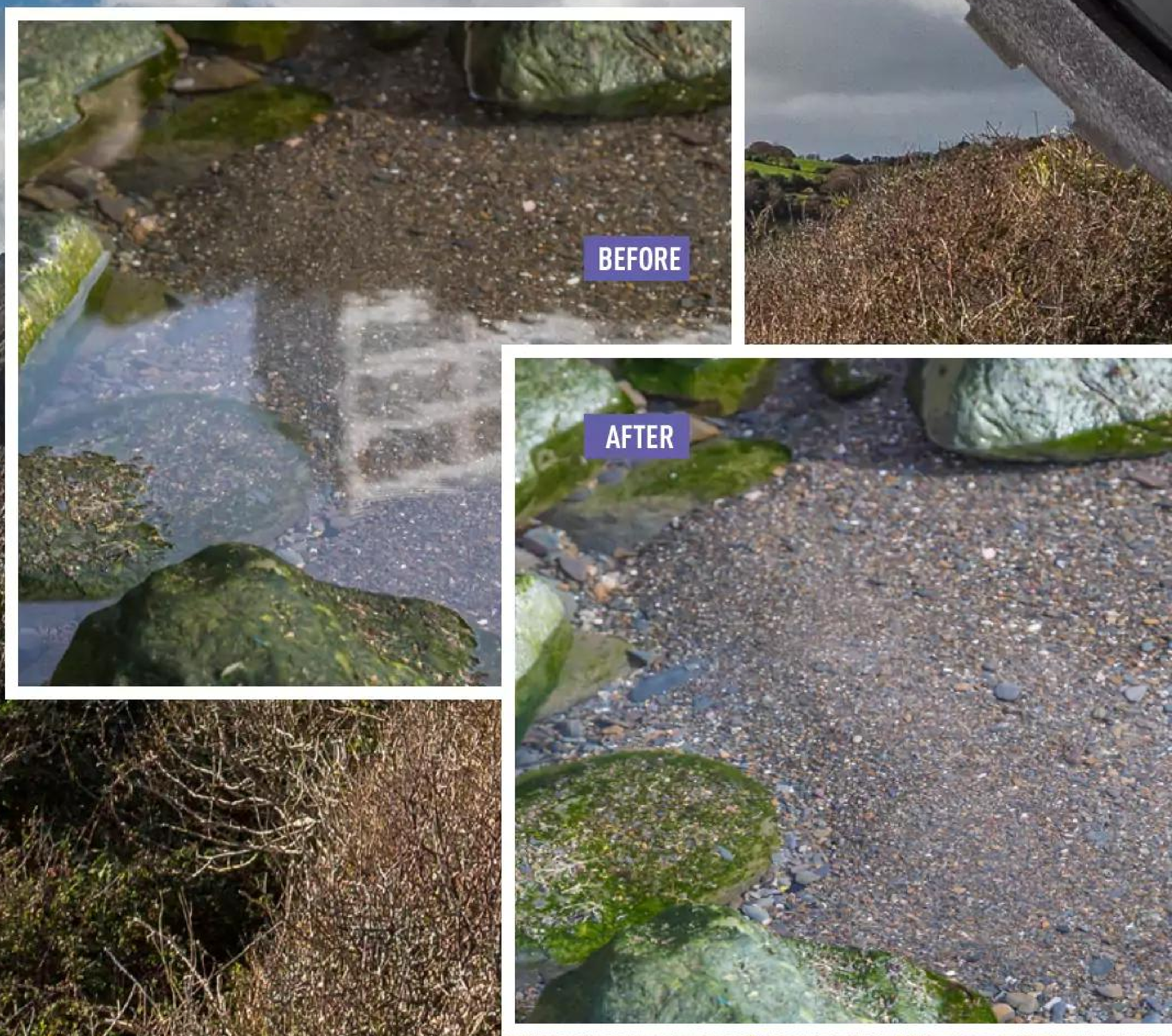
Some of the typical uses for the polarising filter are shown here. From darkening blue skies, to the reduction or elimination of glare and reflections in non-metallic surfaces.

The polarising filter

A circular polarising filter (CPL) is used to increase saturation and to reduce or eliminate certain reflections or glare in non-metallic surfaces. Round CPL filters come in a rotating mount and screw onto the front of your lens; you simply set up your camera settings as desired and frame the shot then, as you rotate the CPL in its mount, you will notice that certain reflections from objects like water or glass will appear and disappear as you continue to rotate the filter, you'll also notice an increase in saturation. The CPL is also used to darken blue skies on sunny days and if there are white clouds in the sky, the contrast between blue sky and white cloud will increase as the blue darkens, by a substantial amount. It's important to know that for a CPL to work at its best, you really need to have the sun coming in at right angles, either from your right or left side.

In the majority of cases, CPL filters are round screw-on types, however there are also some square filter versions available, such as the Cokin X Pro system and Lee 100mm system, it is still a circular filter but it sits in the filter folder frame and can be rotated like its screw-on cousin. One thing to be aware of is that they do not come cheap in fact a Lee CPL, for their 100mm square filter holder system, is around £200 ($245).

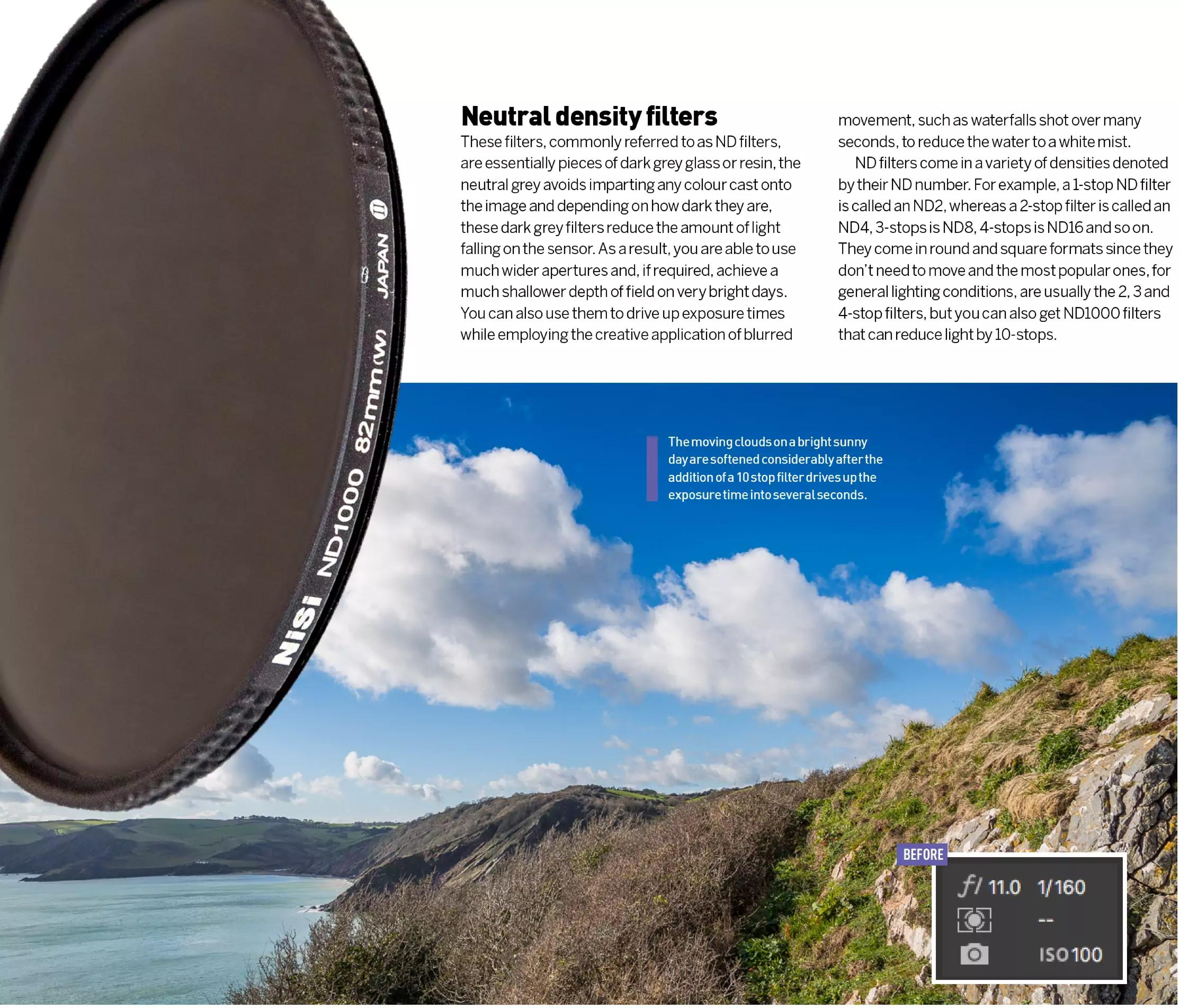




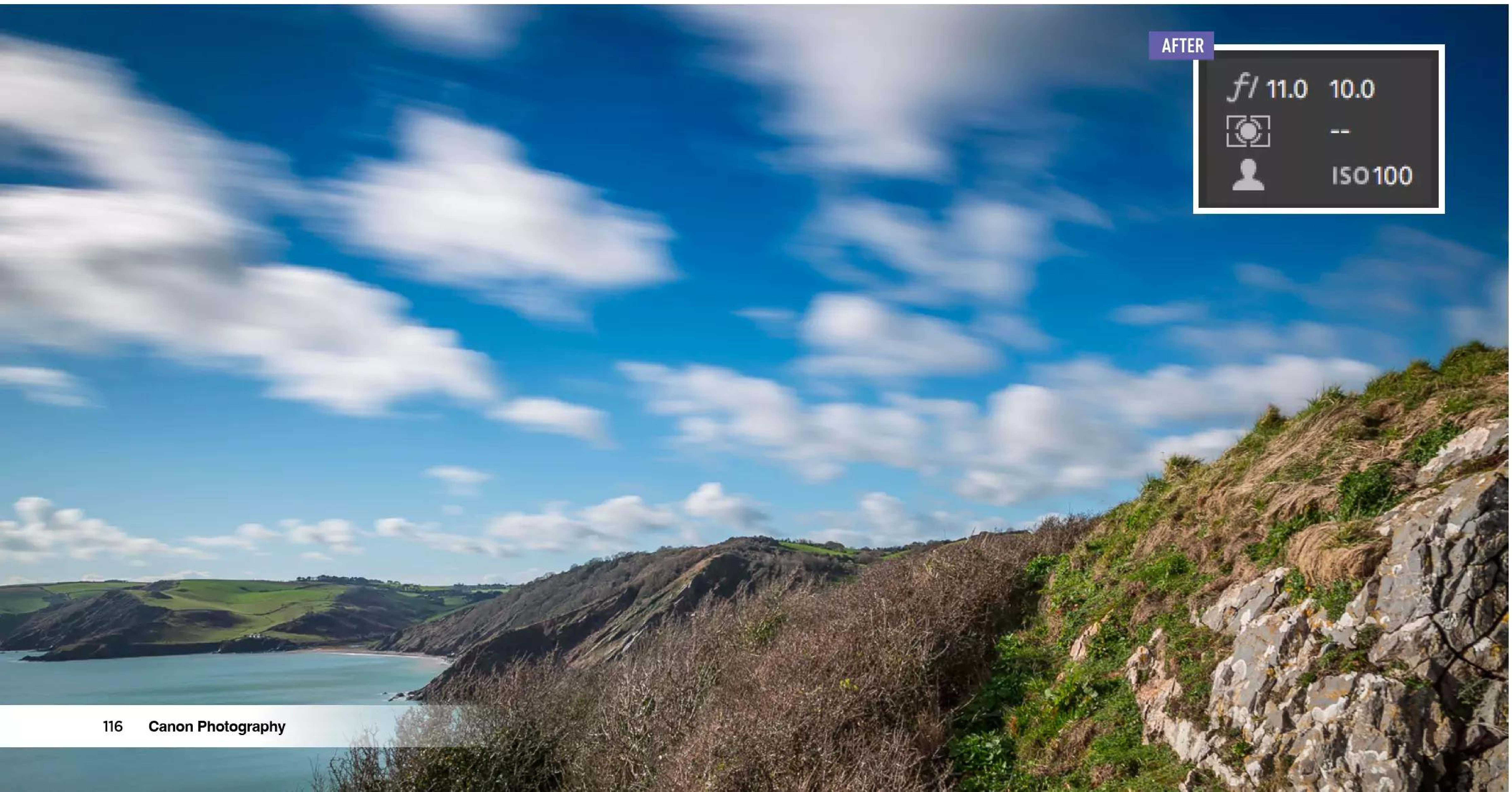
Neutral density filters

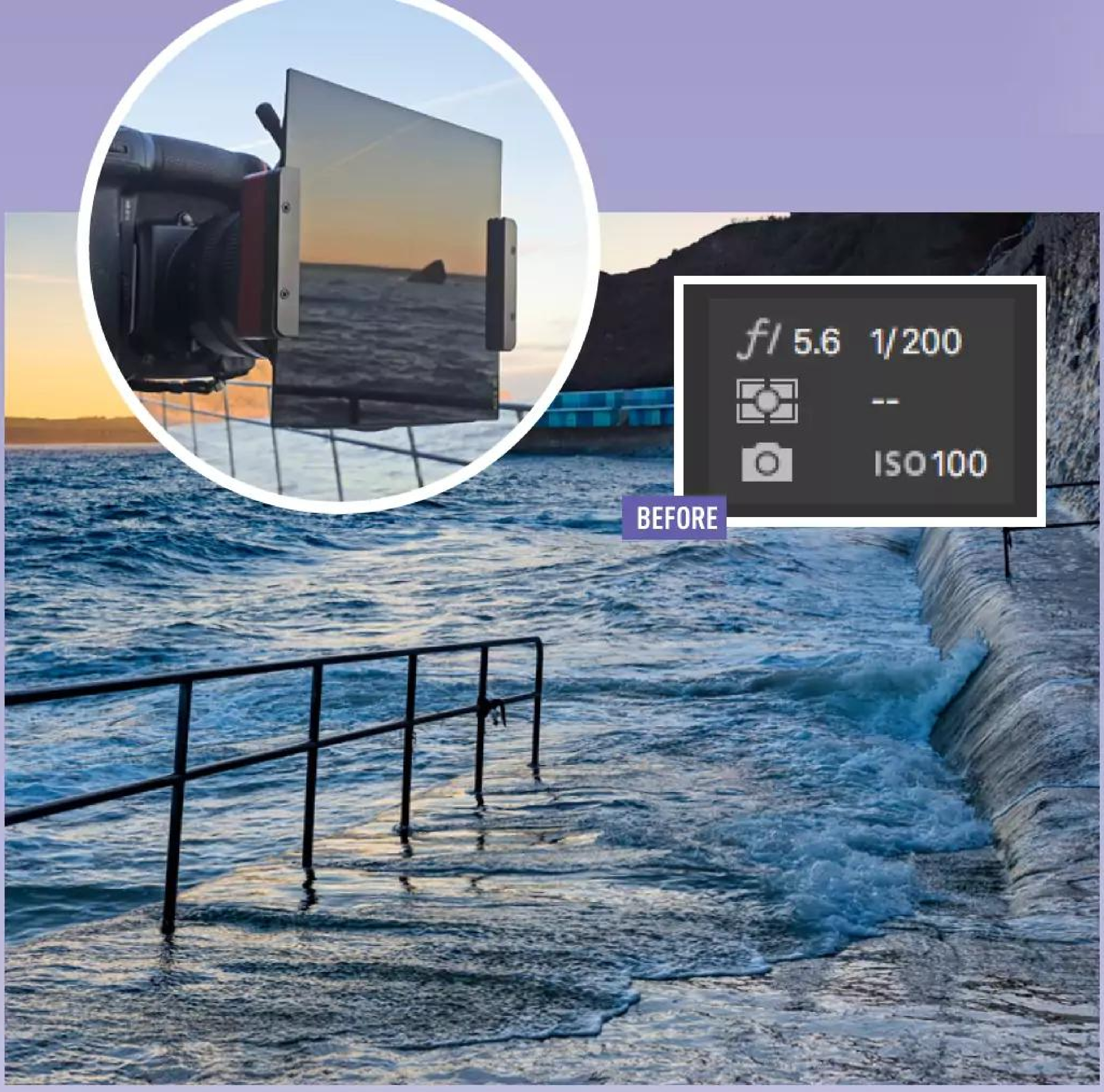
These filters, commonly referred to as ND filters, are essentially pieces of dark grey glass or resin, the neutral grey avoids imparting any colour cast onto the image and depending on how dark they are, these dark grey filters reduce the amount of light falling on the sensor. As a result, you are able to use much wider apertures and, if required, achieve a much shallower depth of field on very bright days. You can also use them to drive up exposure times while employing the creative application of blurred movement, such as waterfalls shot over many seconds, to reduce the water to a white mist.

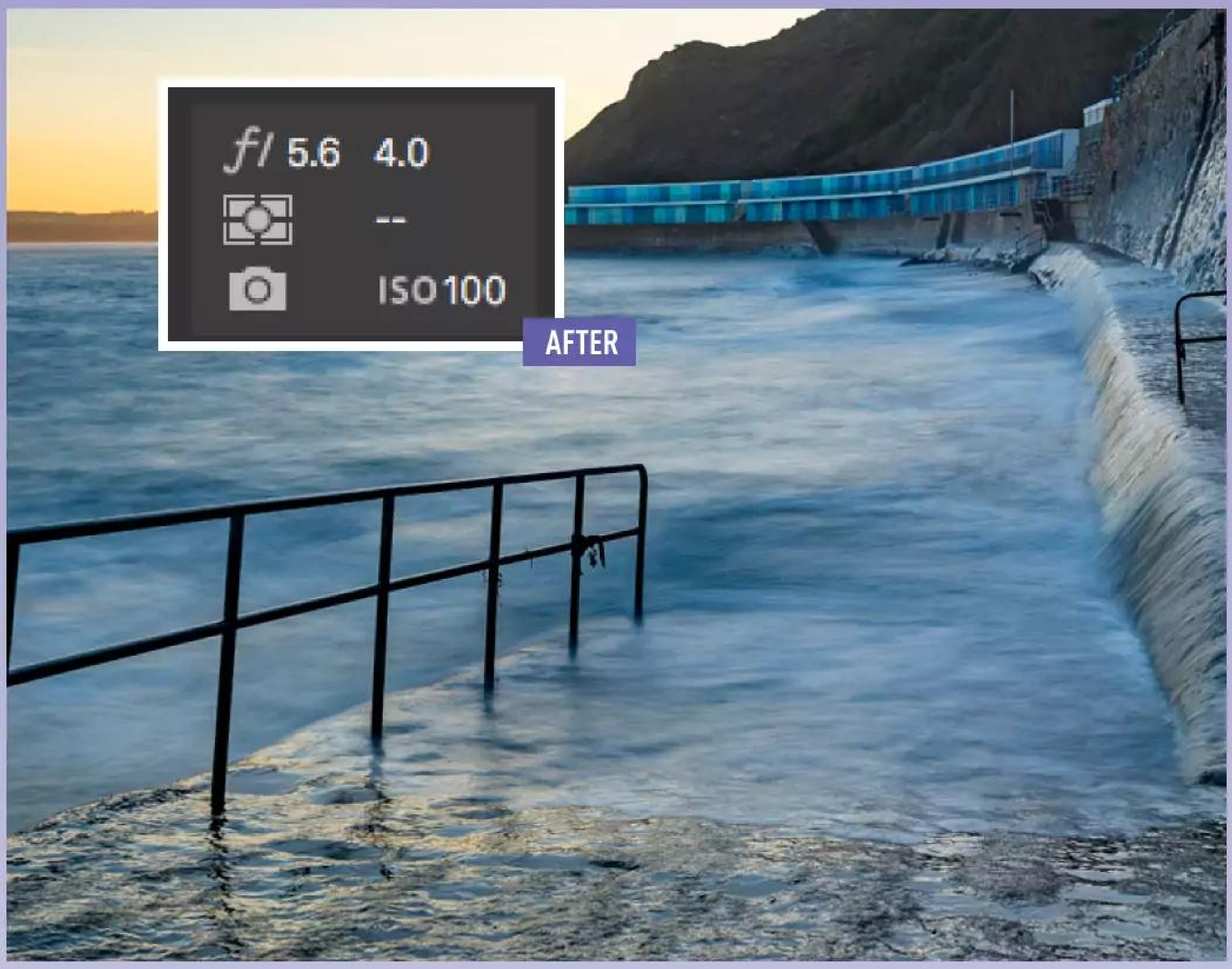
ND filters come in a variety of densities denoted by their ND number. For example, a 1-stop ND filter is called an ND2, whereas a 2-stop filter is called an ND4, 3-stops is ND8, 4-stops is ND16 and so on. They come in round and square formats since they don't need to move and the most popular ones, for general lighting conditions, are usually the 2, 3 and 4-stop filters, but you can also get ND1000 filters that can reduce light by 10-stops.

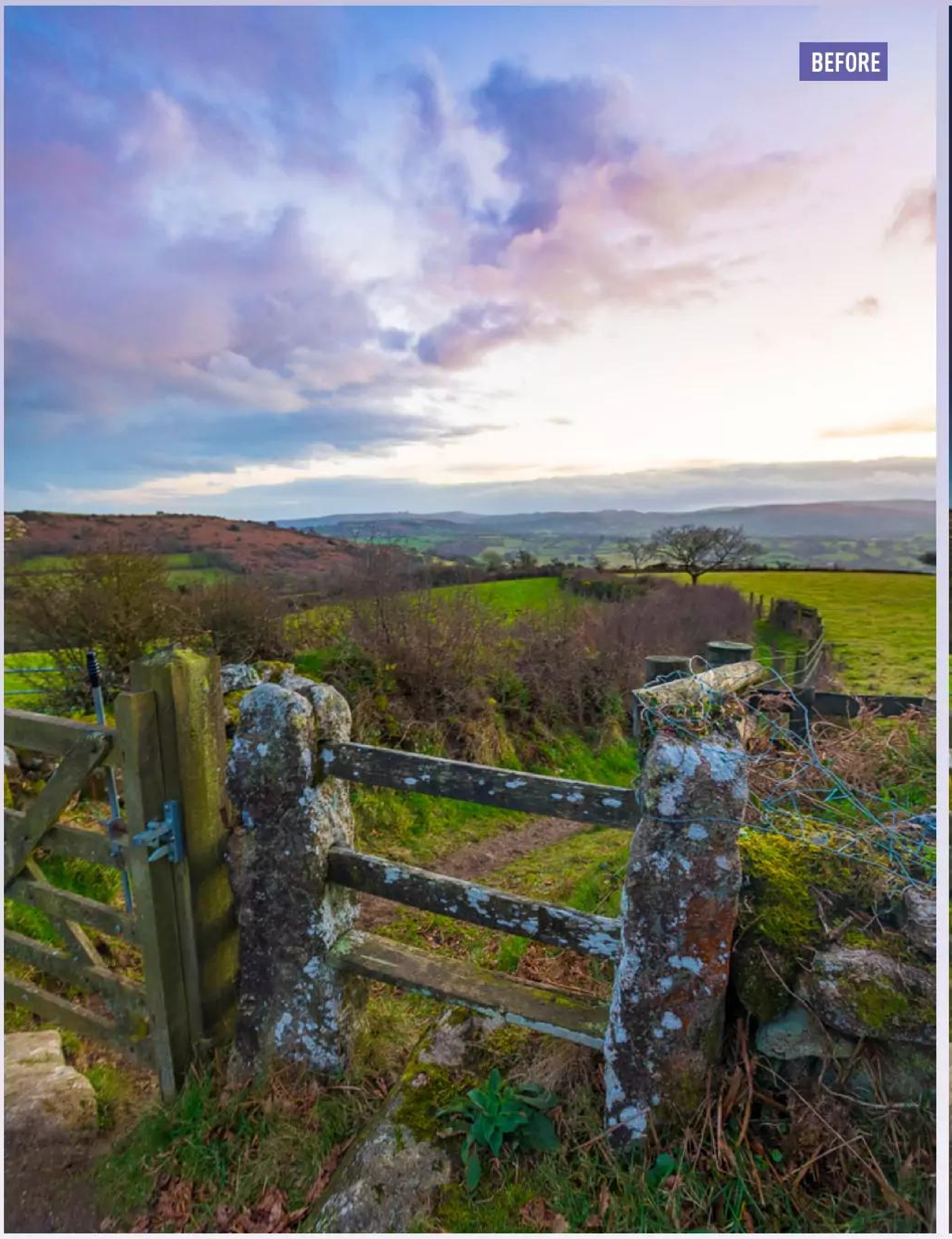


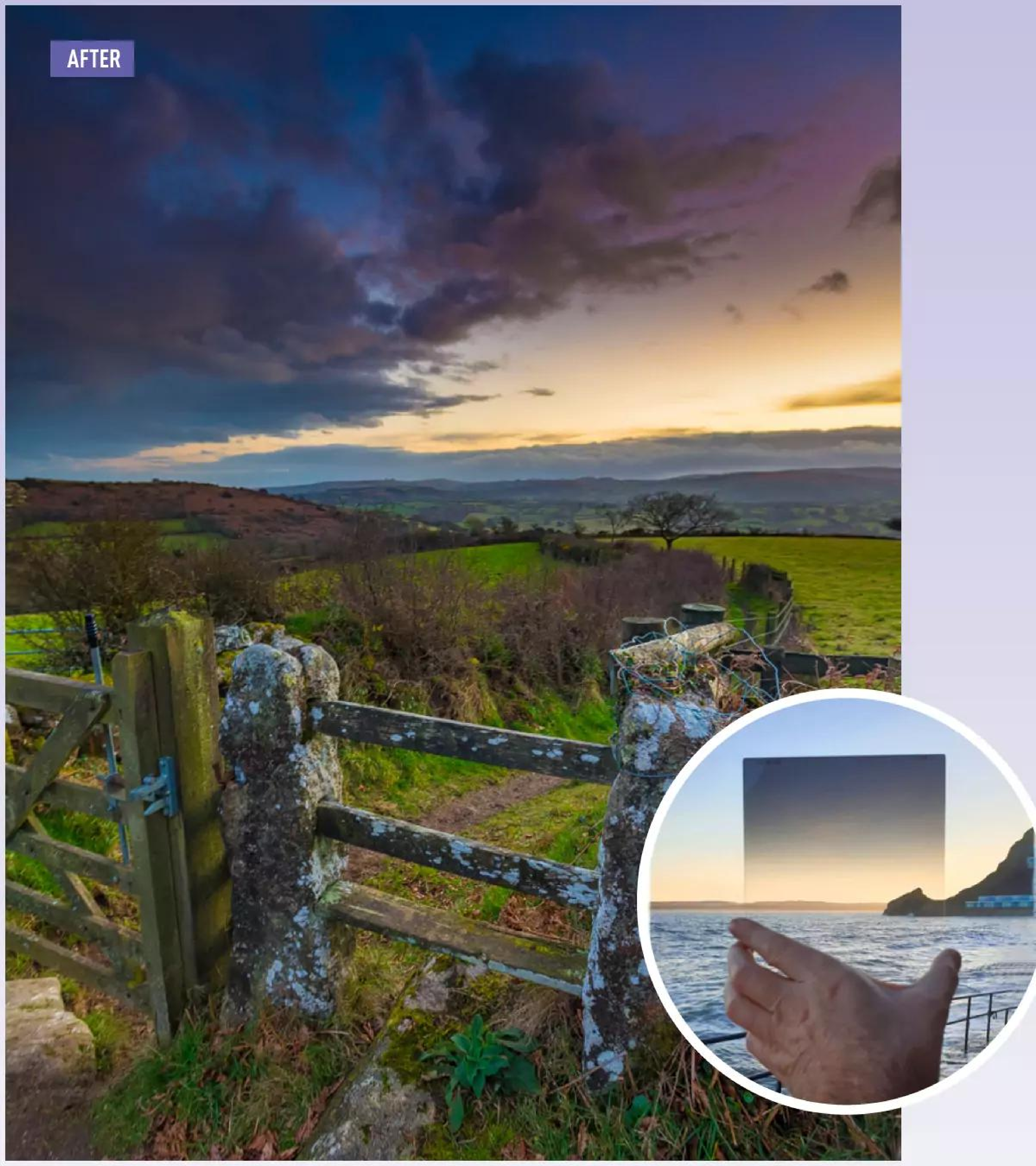
The moving clouds on a bright sunny day are softened considerably after the addition of a 10 stop filter drives up the exposure time into several seconds.







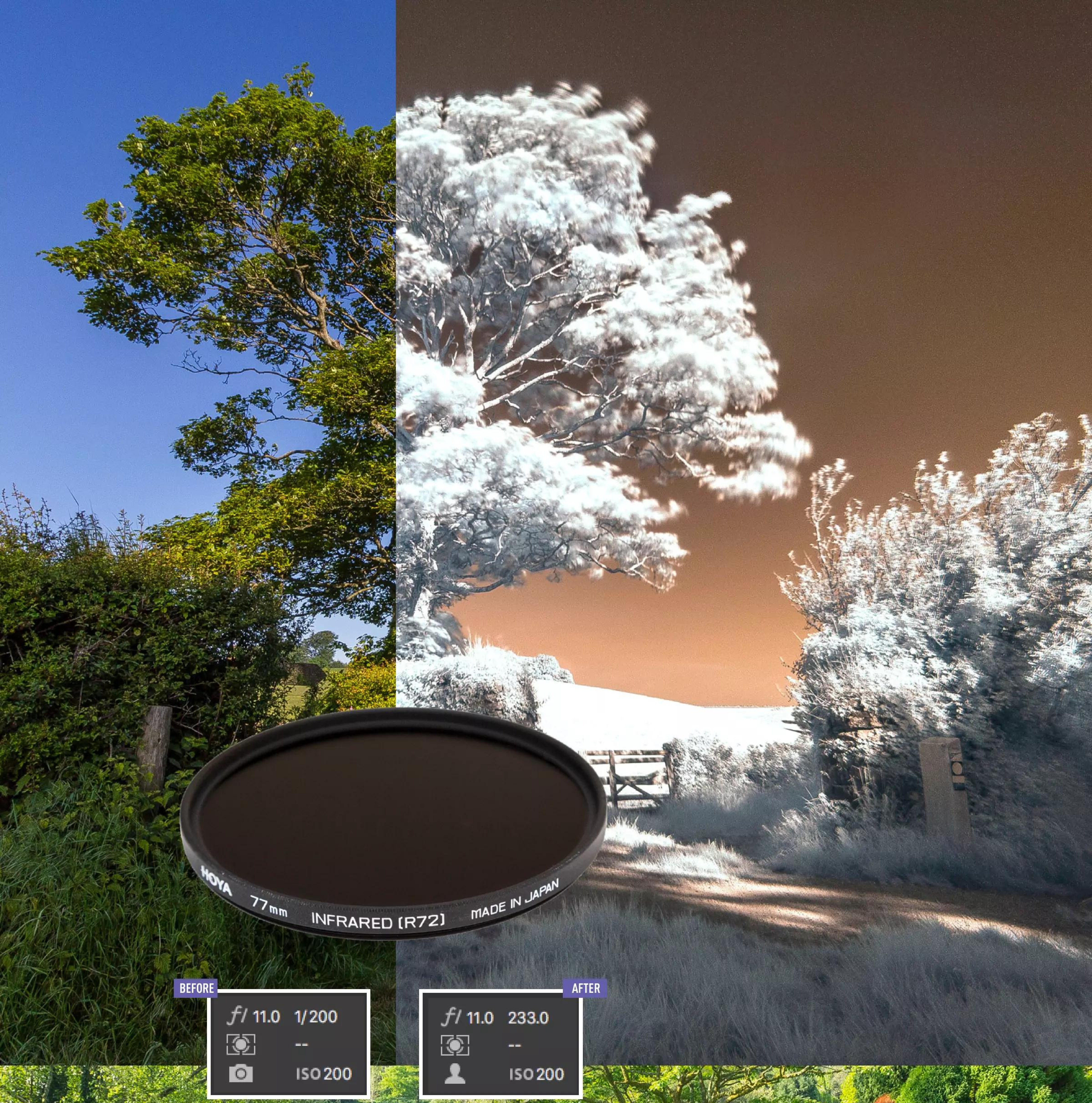


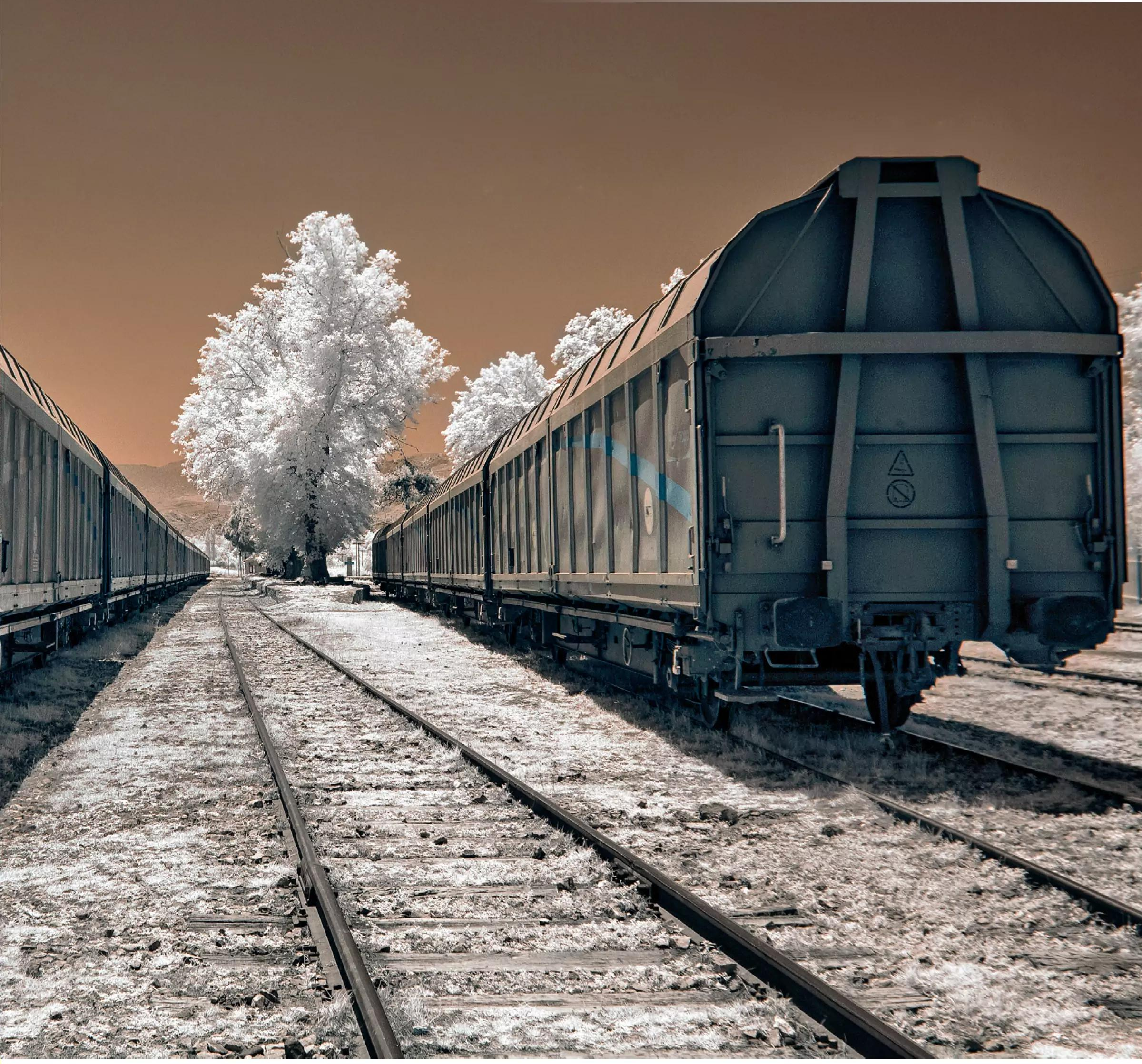


Graduated ND filters

Graduated ND filters behave in a similar way to their standard ND filter siblings, but rather than being a solid grey all over, they fade from dark grey at the top of the filter to clear at the bottom. This transition, from dark to clear, is very effective at balancing the exposure in a scene where you have a bright sky and a darker foreground. Landscape photographers love this filter as it helps to remove the necessity for shooting more than one exposure of a given scene, which is normally done in order to get a well-exposed foreground and a well exposed sky, then blending them together. Like the solid ND filters, they come in various densities and different transitions between the dark and clear areas; you can get ND graduated filters that transition very sharply from dark to clear, over a very short distance, and are good for landscapes where the horizon is free of any obstructions alongside ones that transition very gradually, over a larger distance, for shots where there might be trees or hills in the frame.

For most landscape work, a 2-stop ND grad is enough to keep the sky from overexposing, but if you are looking to shoot bright sunsets and sunrises, then a 3-stop ND grad may be more effective at balancing the overall exposure. Although you can get round screw-on ND filters, they can't be moved, so it usually easier to get the square filter equivalent so you can move it up or down in the holder allowing you to place the graduated part of the filter exactly where you want it.


HOYA
77mm
INFRARED [R72]
MADE IN JAPAN
BEFORE
f/ 11.0 1/200
--
ISO 200
AFTER
f/ 11.0 233.0
--
ISO 200



Infrared filters

Infrared (IR) filters for colour IR photography, are probably the most specialist of all the ones we've listed here, but they can also produce some of the most eye-catching images. An IR image out of the camera looks quite odd, blue skies are a dark bronze colour while green foliage is a milky blue colour, but after processing, they take on a surreal look that many favour. IR filters allow us to capture scenes in ways that conventional photography does not, they only allow certain wavelengths of light that are invisible to the naked eye to be captured by your cameras sensor. The human eye can only see light between 400 - 700nm (nanometers). A good filter to get going with, is an R72 filter that cuts out light up to 700nm, bear in mind these filters are incredibly dark, so long exposure techniques will come into play here.

Be aware that you may be shooting exposures lasting up to a couple of minutes with certain cameras. Some are better at capturing IR images than others, due to the fact that DSLRs have an IR filter that is designed to cut out these wavelengths to a certain degree, ensuring good image quality. Some camera's IR filters are stronger than others so you might need to check your own camera's IR capability before you start. IR filters come in a number of varieties from 850nm, 720nm, 665nm and 590nm. They are round screw-on filters and can be purchased in different thread sizes.

There you have it. That's our roundup of some of the most useful filters we think any photographer should keep in their gear bag. Shut down Photoshop for the time being, get yourself a couple of filters and enjoy being in full control of your camera and the light you're using to create great photos. ■

Fireworks photography

How to capture all the explosive action

There was a time, and not even that long ago, when fireworks in the UK really only happened on Guy Fawkes night on November 5th or as a climax to some massive celebration or event. If you wanted a chance to photograph a big display, you were fairly limited and had to travel large distances to find them, or buy your own and set them off in your garden. These days it would seem that firework displays happen with a much greater frequency. Local towns will often end staged events with a display and there are even fireworks competitions where a number of teams with big budgets will each stage 10-15 minute displays. These competitions will often happen over a couple of consecutive nights so you get a couple of bites of the cherry so to speak. If you have access to a local display, what is involved in actually capturing the action? Photographing fireworks is easy and great fun, although it does require a little bit of preparation on the part of the photographer, and if you've never shot in full manual mode before, this is a good time to give it a go. It's not in the least bit difficult and we can show you how.

"These days it would seem that firework displays happen with a much greater frequency."

f/10.0 2.0

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ISO 160

The basics

Since this is a guide on shooting fireworks, you are going to be working in the dark. This means you will be dealing with longer exposures than normal and so the first order of business is to mention that all important tripod. Without the tripod, you cannot fix your camera in place in order to prevent unwanted image blurring due to camera shake. A blurry image cannot be rescued with post processing. Even a tiny amount of movement can ruin a shot. Get your camera locked down securely on a good, sturdy tripod. You can also hang a heavy weight from the tripod's centre column in order to help minimise any kind of movement.

Some people also think that if their camera has image stabilisation (IS), turning it on will also help. In fact, it can have the opposite effect. A camera with IS turned on that is locked in place on a tripod, can actually generate unwanted image blurring. The effect is generally more noticeable at longer focal lengths, but it is there. Remember then, turn off IS when the camera is securely mounted.

Cameras and lenses

The great thing about this kind of photography is that you don't really need any specialist cameras or lenses. You are more than likely going to be dealing with exposures no longer than a few seconds, so as long as you can set your camera in manual mode and dial in a maximum exposure of 10 seconds, you will be fine. In addition, if your camera does have a setting for Bulb mode, which allows the shutter to be kept open as long as the shutter button is pressed, then this is also useful.

Lens choices are also not critical here. Even a cheap point and shoot camera with a built-in lens has a focal length range perfect for this kind of work. You will also be dealing with apertures around the f/8-f/11 mark, so expensive f/1.4 lenses need not apply. Ultra wide-angle lenses are possibly going to be less effective if you are shooting from a distance, which is very likely given that the display has to be a certain safe distance from the crowds anyway.

Remote release

Since you've gone to all the trouble to secure your camera and lens to a tripod, manually pressing the shutter release button to capture your shots is just reintroducing the possibility of jogging the camera. To avoid this, you could use a remote release which can connect to your camera via a cable or by using a wireless version to trigger the camera instead. Using a remote

From a simple cable release to activate the camera without touching it, to more complex, programmable intervalometers, you have plenty of affordable triggering options for your DSLR.

HONGDAK
DELAY LONG INTVL N
SET
TIMERSTART/STOP
LOCK

Even point and shoot cameras can provide you with some great fireworks photos. They may not have ultra wide lenses, but since you are likely to be at a distance, that is not going to be an issue.

Canon
CANON ZOOM LENS 25x IS
G3X
USM

FRICTION
FRICTION
Manfr

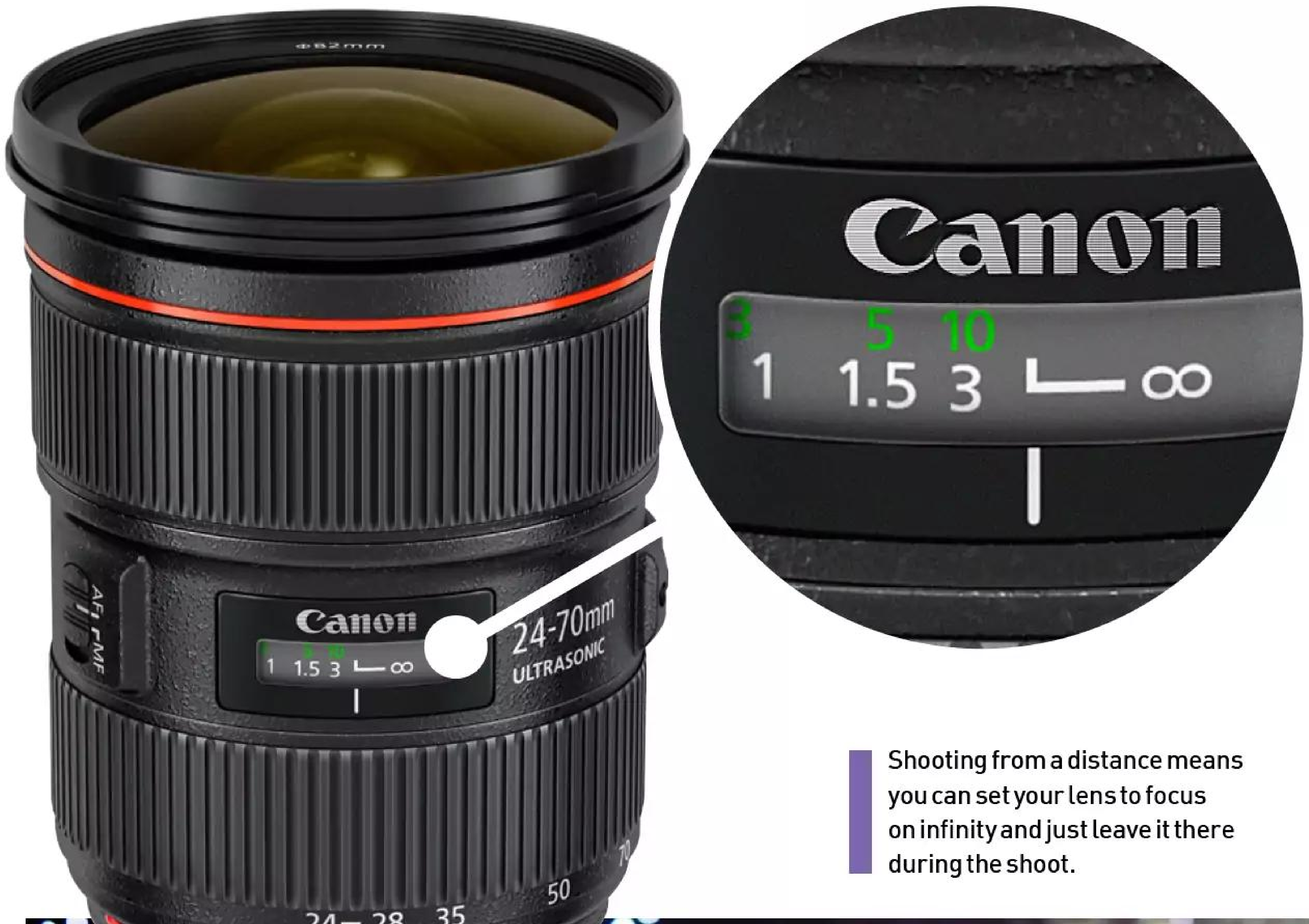
A sturdy tripod is essential to eliminate camera shake and prevent blurry images.

release removes the possibility of nudging the camera as you press the button. If your camera doesn't have this facility, but does have a self-timer, you can use this at a pinch. The downside is that self-timers usually give you either a 10 second or 2 second countdown before firing. Even a 2 second delay may be tricky when it comes to trying to time the start of your exposures with the fireworks as they are going off.

Focusing in the dark

Once you're all set up, it's time to figure out how to focus in the dark. As a general rule, since you are going to be some distance from the action, you can set your lens to manual focus and set it at infinity and leave it there. The infinity symbol, which looks like the number eight on its side, will be marked on your lens. If your lens doesn't have a focus distance window, you can always use a torch to illuminate a point about one third of the way into the scene or roughly 5m-10m. You can then set manual focus on that spot.

Cheap but powerful LED head torches are extremely useful in keeping your hands free for camera operation and button pressing.



Shooting from a distance means you can set your lens to focus on infinity and just leave it there during the shoot.

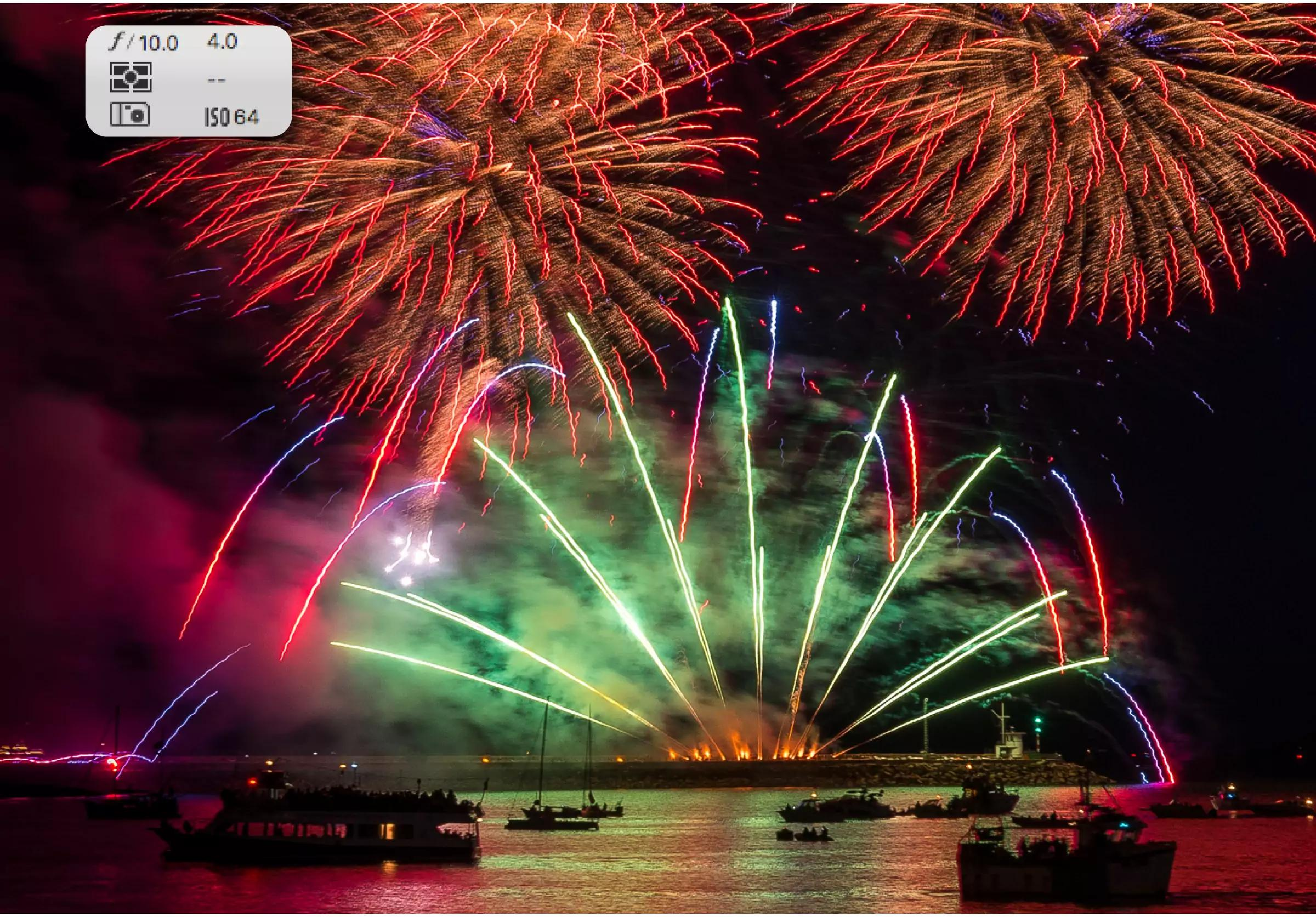
Bring some light

Speaking of torches, it makes sense to bring one. Better still, a head torch is great for keeping your hands free to alter settings and operate the remote release if you are using one. Head torches are lightweight and cheap to buy. Their LED bulbs mean that a set of batteries will last for ages and can provide plenty of light to work by.

Setting up

It makes sense to get to your venue early in order to nab the best spots to make the most of the display. Arriving late and having a sea of heads in your foreground, dominating the shot, is not going to work unless you can raise your camera on its tripod high above the crowd and use them to frame the bottom of the shot. If you do this, you may need a small stepladder or stool to get your head up to the same height as your viewfinder.

As long as they are not too intrusive, you can use foreground crowds to frame the lower portion of your shots.



About Raw

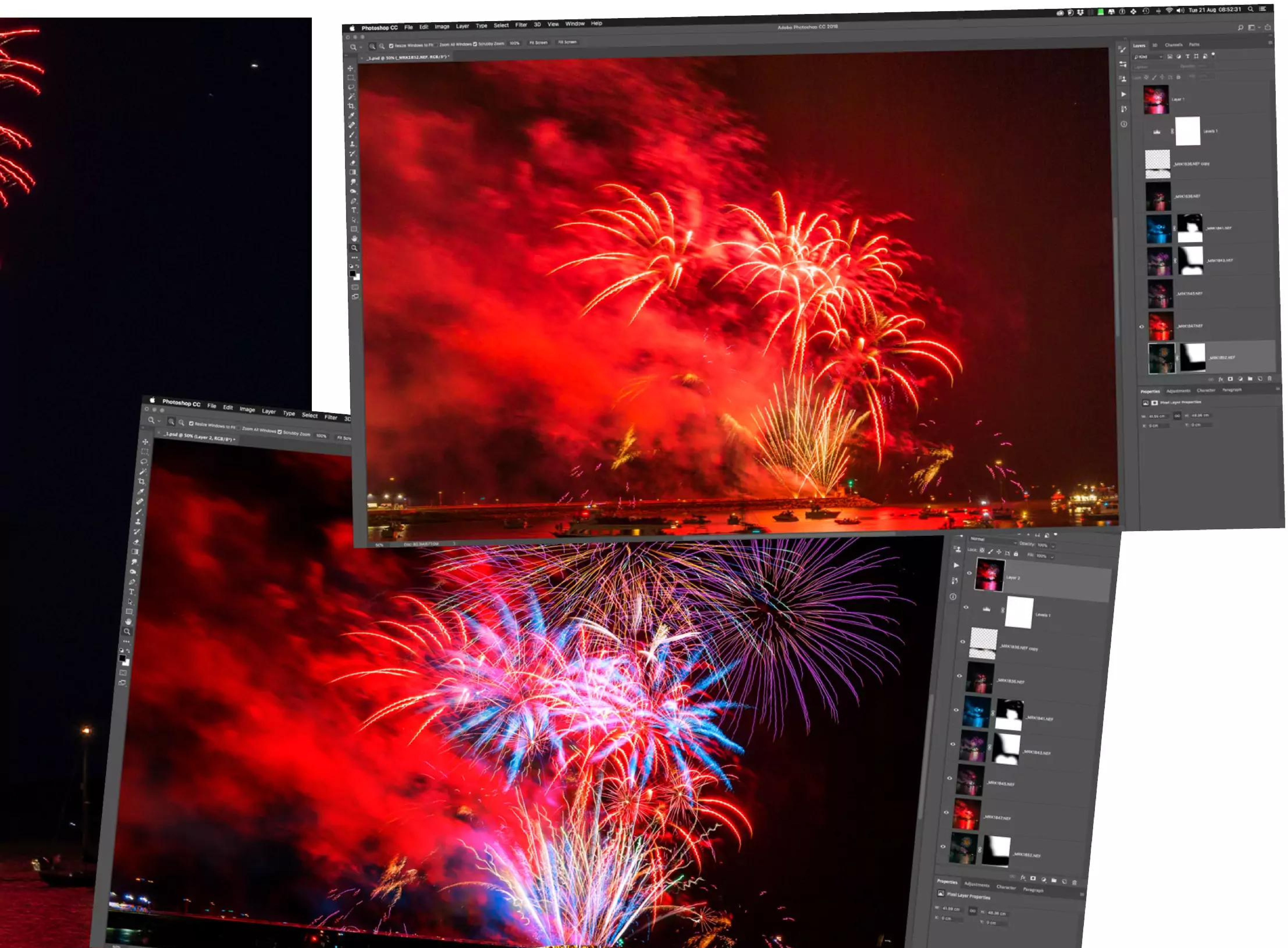
Yes, once again we have to talk about Raw mode. If your camera supports it, use it. You can glean so much more data from a Raw file than an already processed jpeg file. Besides, if you take all your shots as jpegs and use the wrong white balance for instance, all your jpegs will be processed with the wrong white balance. With Raw, it doesn't matter what white balance you use, as you can alter it at the post-process stage anyway.

Settings

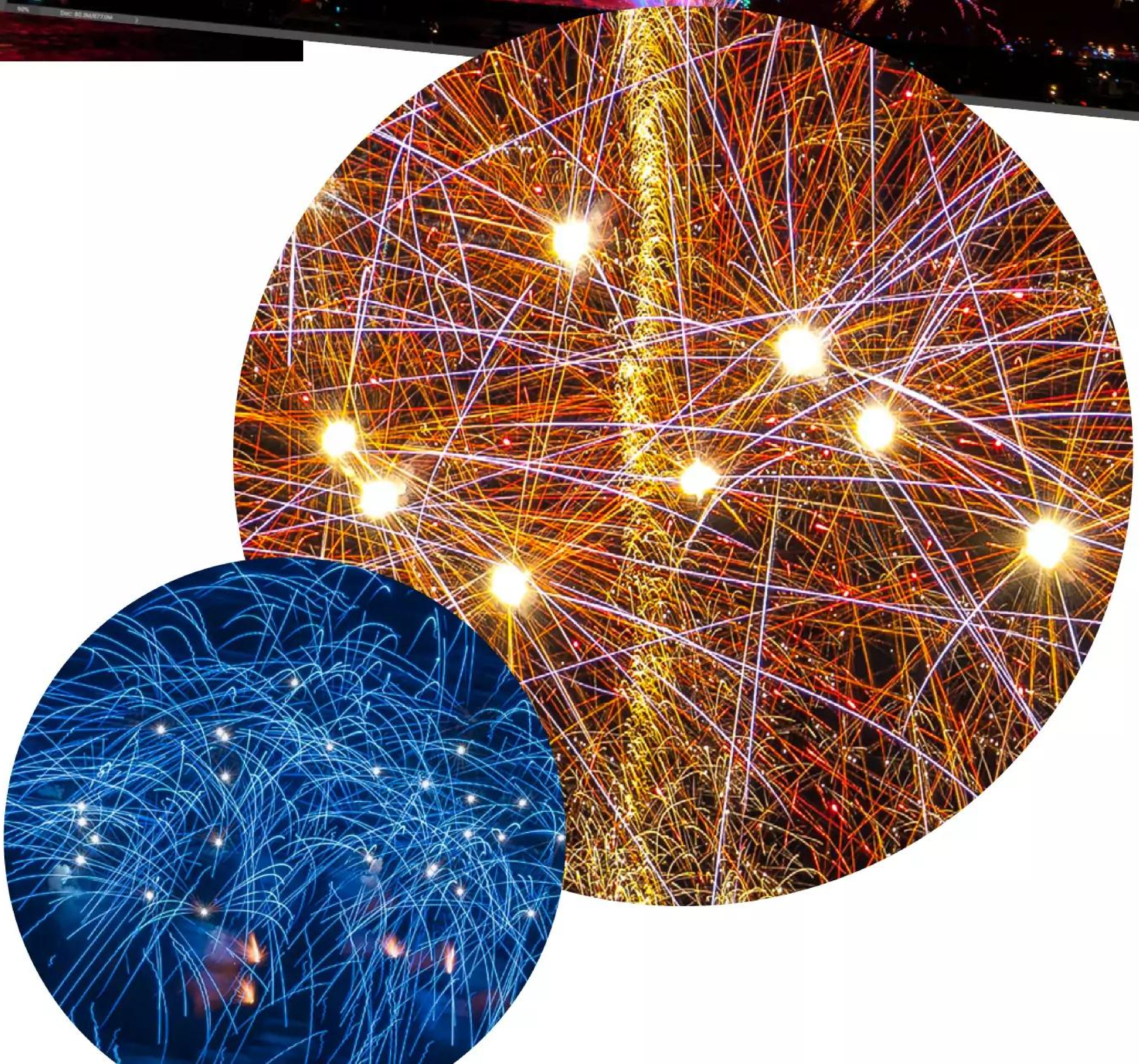
Until the fireworks actually start, it will be difficult to actually get your settings dialled in precisely. If you were to try to get a decent exposure without the light from the fireworks themselves, you may find that the ambient light is much dimmer, requiring a longer exposure. That longer exposure may result in the much brighter fireworks being badly overexposed and blown out to white. A very broad rule of thumb is to try starting with an aperture of f/11, a shutter speed of 2s and ISO 200. Once the display starts, you can grab some test shots and analyse the images on your camera monitor screen. If the images are blown out, you can either reduce the amount of time the shutter stays open, increase the aperture to f/16 or drop the ISO to 100 or 50. Take another shot and see how it affects your photos. Try altering one setting at a time rather than making lots of changes at once. Be aware that different fireworks and their colours will have different intensities too. If the fireworks look too dark, you can increase the ISO gain, open up the aperture to f/8 or increase the exposure time. One thing to bear in mind is that longer exposure times will create much longer light trails in your photos. This comes down to personal choice of course, but bear that in mind.

Take the shots

Now you can concentrate on getting the shots. Firework displays have low-level and high-level displays. The high-level fireworks generally give the bigger explosions and are usually fairly easy to spot as you can see the fired rockets climbing much higher into the sky. It comes down to timing to guess when the rockets will actually explode, but keep your thumb on the remote release and get ready to press. If you have a decent sized memory card, just keep shooting. There is actually a great little trick you can employ once you are back at home to combine some of the shots that have little going on in them. Another option is to set your camera to Bulb mode. Then you take a small piece of black card and cover the lens with it. Be careful not to bump the camera with it. Open the shutter and keep it open using Bulb mode and only uncover the lens when there is firework activity that you want to capture. If the lens is covered, no light is getting in, so you can keep the shutter open as long as you want. Keep uncovering the lens for each light trail you want captured. Once you have amassed a few seconds worth of light trials, you can close the shutter again. You can experiment with different focal lengths to pick out details from the display and also try shooting in either landscape or portrait orientation.


Photoshop CC File Edit Image Layer Type Select Filter 3D View Window Help

Merging multiple shots in Photoshop means you can create an image absolutely bursting with light.



Post-processing

Once you have your shots in the bag, you can process them using your favourite processing software. You can recover quite a bit more from Raw files than jpegs. A certain amount of the highlights can be pulled back from overexposure and the darkest shadows can be lifted too, before the image starts to degrade. You can also merge a number of the more empty looking shots in Photoshop to create much more densely populated fireworks images, if that's what you want. Just load a number of them into a document as a series of layers and set all of their Blend modes to Lighten to combine their brightness; crop it into a tighter composition and save that out as a single image.

Firework photography is great fun and hopefully, after reading this guide, you'll realise that it is quite easy to capture all the excitement and action from your next local display and create some wonderful images for yourself. ■

Pet and animal portraits

Move over humans, it's time to get our furry friends ready for their close-ups

f/5.6
1/640
-0.67
AWB
ISO 200

> "Get the eyes nice and sharp. Just like humans, this is a natural point of focus."

We love our pets. In fact for most people they are more than mere pets and become more like family members, the recipients of love, affection and lavish attention. It is likely then that their owners, at some point, are going to want photographs of their furry friends (or scaly, feathery or otherwise). I have a dog, and the number of photos that include him specifically outnumber those of all my other family members put together. However, pet photography presents its own special problems. Animals, as we all know, can be unpredictable, lazy, aggressive, hyperactive and downright cute. If you're thinking of trying pet photography, here are a few pointers to get you started.

Pet personality profile

You don't need to sit the pet in question on a psychiatrist's couch and ask it to tell you about its mother, but before you start snapping away, find out about your subject's personality and habits. Where does it snooze if the sun is out? What is its favourite toy? Is it lazy, sleepy, or does it like to perch on a garden fence or hide in the grass? Take time to chat with the owner and observe your subject to gain some insight. It's also worth spending a little time getting to know the animal yourself. Cats, dogs, horses, they all have personality, and you need to ensure they are comfortable being around you, and you around them. Scaring a pet right at the

f/2.0
1/2500
--
ISO 100

outset is not going to make for a particularly happy or productive photo shoot.

Close quarters

Think about getting in close to your subject. If the pet is comfortable with you, and if it isn't too skittish, fill the frame with the pet's face. Get the eyes nice and sharp. Just like humans, this is a natural point of focus, although focusing on the snout of a dog or cat can also make for an interesting image in its own right. A good portrait focuses on the subject and not the background. Yes, there are times when shooting wide can create a great environmental portrait, but make sure you get a good selection of close-ups. A macro lens is perfect for capturing details of the pet, and shooting with a wide aperture keeps any background distractions out of focus. Obviously if the animal is not content to keep still for more than a second, this can be a challenge. Keep snapping away; try using your

Both images you see on these pages were shot outdoors with a medium long lens and a shallow depth of field to keep shutter speeds high enough to avoid the possibility of camera shake.

f/2.8 1/1250

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ISO 200

Duncan was photographed with a Canon EF 70-200mm f/2.8 L lens. The aperture was set at f/2.8 and at the full focal length of 200mm. This produces some lovely selective focus and gives the benefit of a fast shutter speed to freeze the water.

Try to keep background distractions to a minimum.

Capture funny 'moments'.

Keep the eyes nice and sharp.

camera's continuous autofocus to track the animal as it moves. If it's proving too difficult, let the animal play a while, and try again. Pets have very short attention spans, so keep it fun, break it up a bit if you have to and always reward and fuss them when they do well.

On the level

Your average dog is a couple of feet tall, cats even smaller. The average adult human is about 5' 7". If you photograph a pet while you're standing up, all you're going to see is the top of their head and their backs, not what you want for a portrait. Get down to their eye level, and see the world from their perspective. If you are able, get lower still. Try pre-focusing your camera and just holding it at ground level so you can look up at the pet. It's worth a try just for a new angle on things.

Lighting

When meeting a new animal, bring a flash and, with the owner's permission, while greeting or playing with the pet, fire a couple of test flashes away from them to see their reaction. In daylight particularly, they never seem to mind the flash at all. If they do mind, then stick with natural light and use a white or silver reflector if you need to fill in any shadow areas. Indoors, a bright continuous light may be preferable. I have a photoflood light that, rather than using old tungsten bulbs, uses three daylight-balanced energy saving bulbs. They are housed in a 22" reflector that I can cover with a diffuser to soften the light if need be. You can also try placing your subject near a window to use the natural light. If I am using flash with a willing subject then I invariably use cross-lighting, avoiding shooting a flash directly at them.

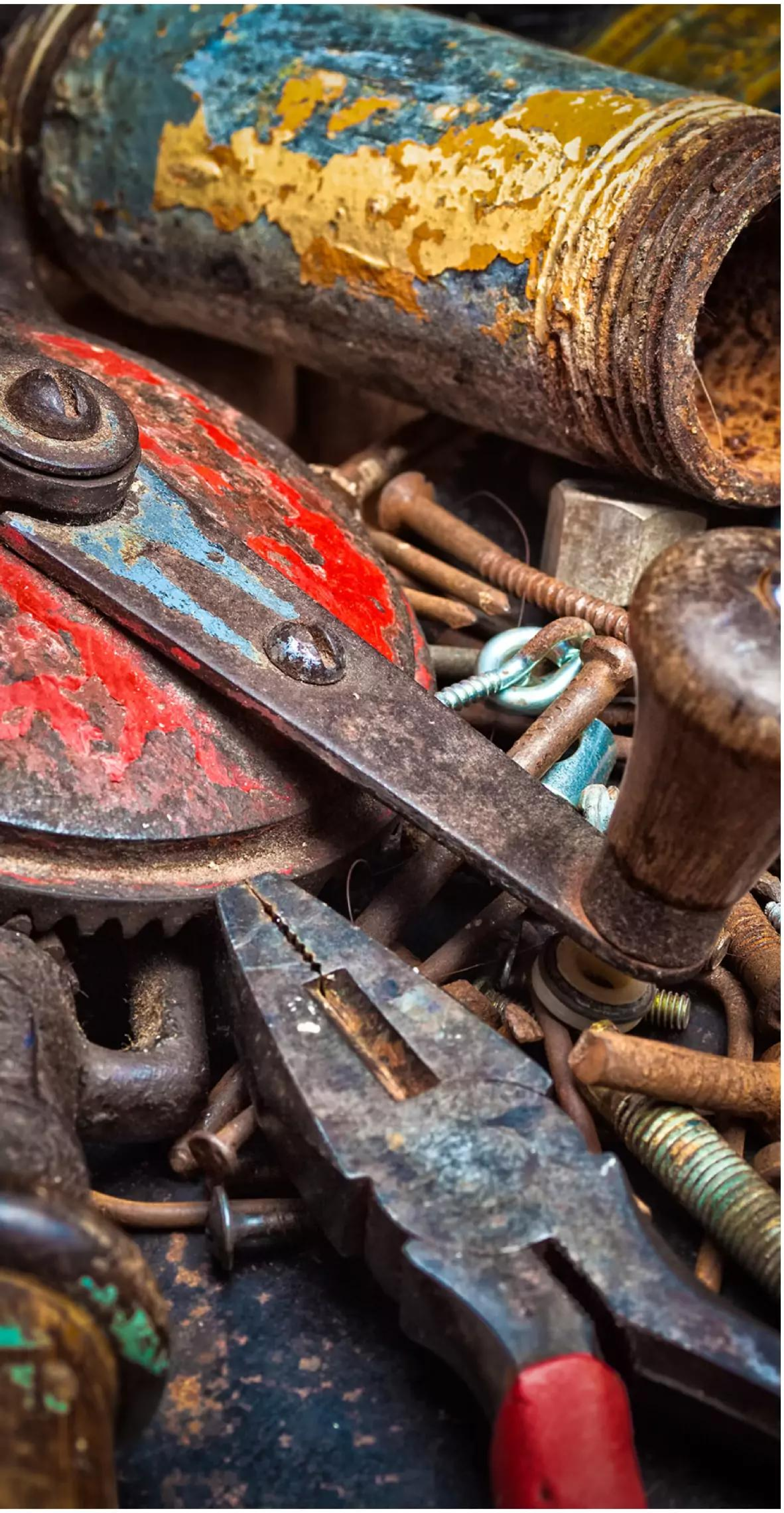
Be patient and carry on!

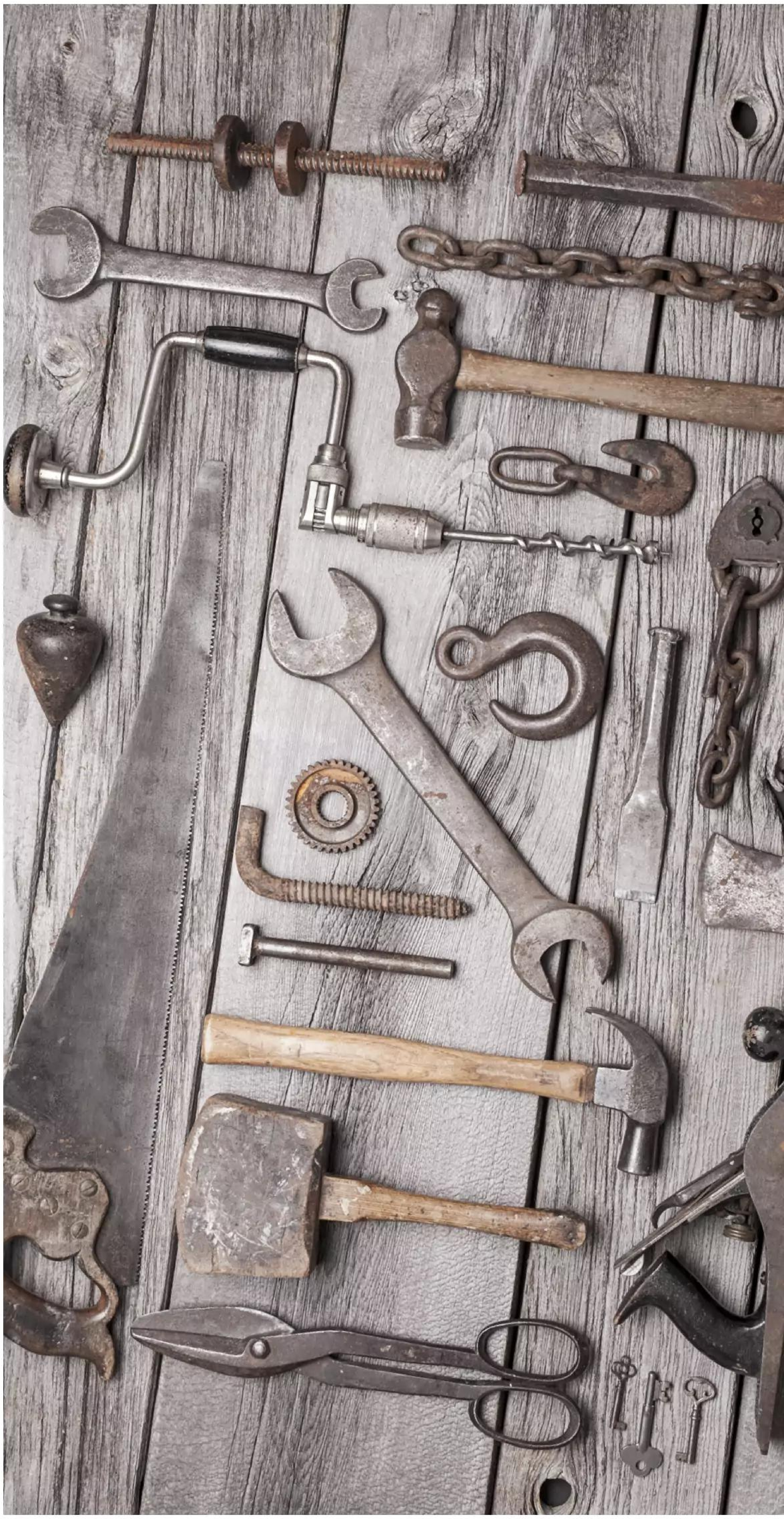
As they say, "memory is cheap, but memories are priceless". Pets are challenging subjects so you're just going to have to stay sharp and keep shooting. The more you shoot, the greater your chances of hitting that perfect shot! ■

Still life photography

Sounds simple, but still life is a demanding art form

Still life photography is defined as the depiction of an inanimate subject. You are probably familiar with classic paintings of still life subjects which often tend to be bowls of fruit, bottles, and flowers. Although some might frown upon photographing a still life that mimics an old painting, it actually takes a deft touch with lighting and a skill in knowing how to set up and arrange your particular subjects. In fact, it is said that a still life photographer is 'making' a picture, rather than 'taking' it. Of course still life is not limited to bowls of fruit and such, but on a rainy day, when you're stuck indoors looking for a photography project, a good still life can teach you a lot about light, texture, contrast and composition.





The two images above represent the key difference between 'found' still life images and 'created' still life images. The image of rusty old tools in a tool chest on the left could easily have been found by the photographer who decided to record it as it was discovered. The image on the right is obviously a deliberate creation, and has the hallmarks of being lit in a studio environment.

Still life does fall into two categories. The first is 'created' still life which, as the title may suggest, is where the final scene has been crafted and constructed with a deliberate final result in mind. It may also have been lit by artificial means. Daylight or any ambient light was not present in the final shot. The second type is 'found' still life. This is a subject that has been found and its arrangement has occurred by natural means or at the very least had no input from the photographer in creating the scene that they shot. It is as they found it.

Creating a still life

For our example, we are going to assume it's a bad weather day, and we'll set something up indoors and create a still life. Where do you start? Well, the best idea is to start with something simple, on a simple background, with simple lighting. Sounds simple, right? It is good practice to begin with an object that is non-reflective, if you're new to still life photography, you don't want the additional headache of dealing with unwanted reflections if you're not able to black the room out. Once you've made your executive decision about the subject you are going to capture, you'll need to build a set for it to inhabit. You'll need a surface or backdrop to create your environment for the subject. It can be as simple as the surface of a wooden table or a piece of fabric, cloth or canvas.

Set the scene

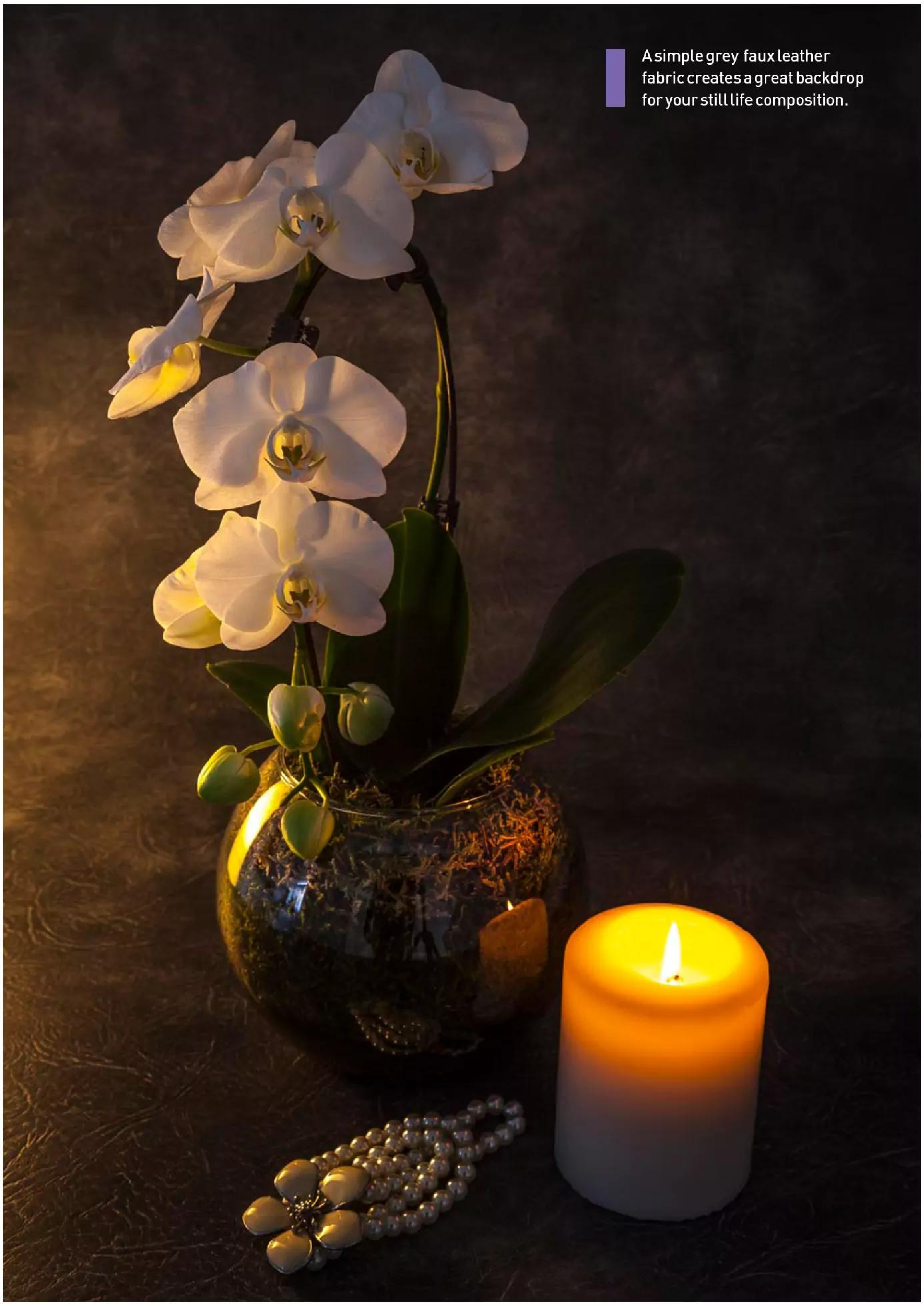
Light backgrounds have a light and pleasant mood, whereas dark backgrounds are more dramatic. It is generally held that the background colour should be of similar tones and colours as your subject, perhaps just a shade lighter or darker than the main elements. Although that is the rule, you can experiment with colour combinations that suit your taste.

Your subject

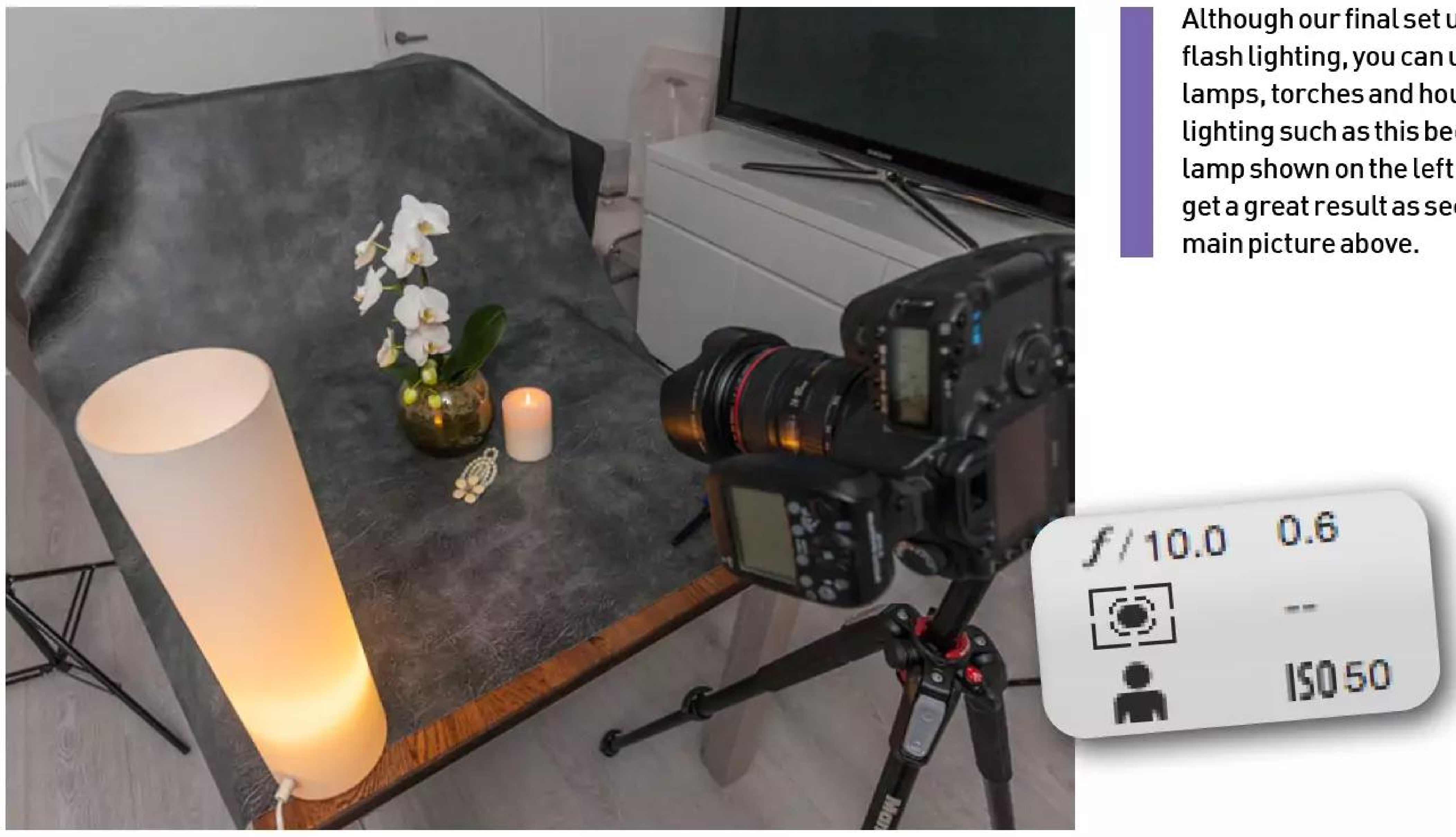
With a background set up, it's time to introduce your subjects. The beauty of still life work is that you can shoot literally anything you want. You can amalgamate several disparate elements or harmonise the subjects to your heart's content. There is a quoted maxim that arranging objects in odd numbered groups (1, 3 or 5 etc.) is more harmonious than even numbered groups. However you do it is up to you.

Lighting up time

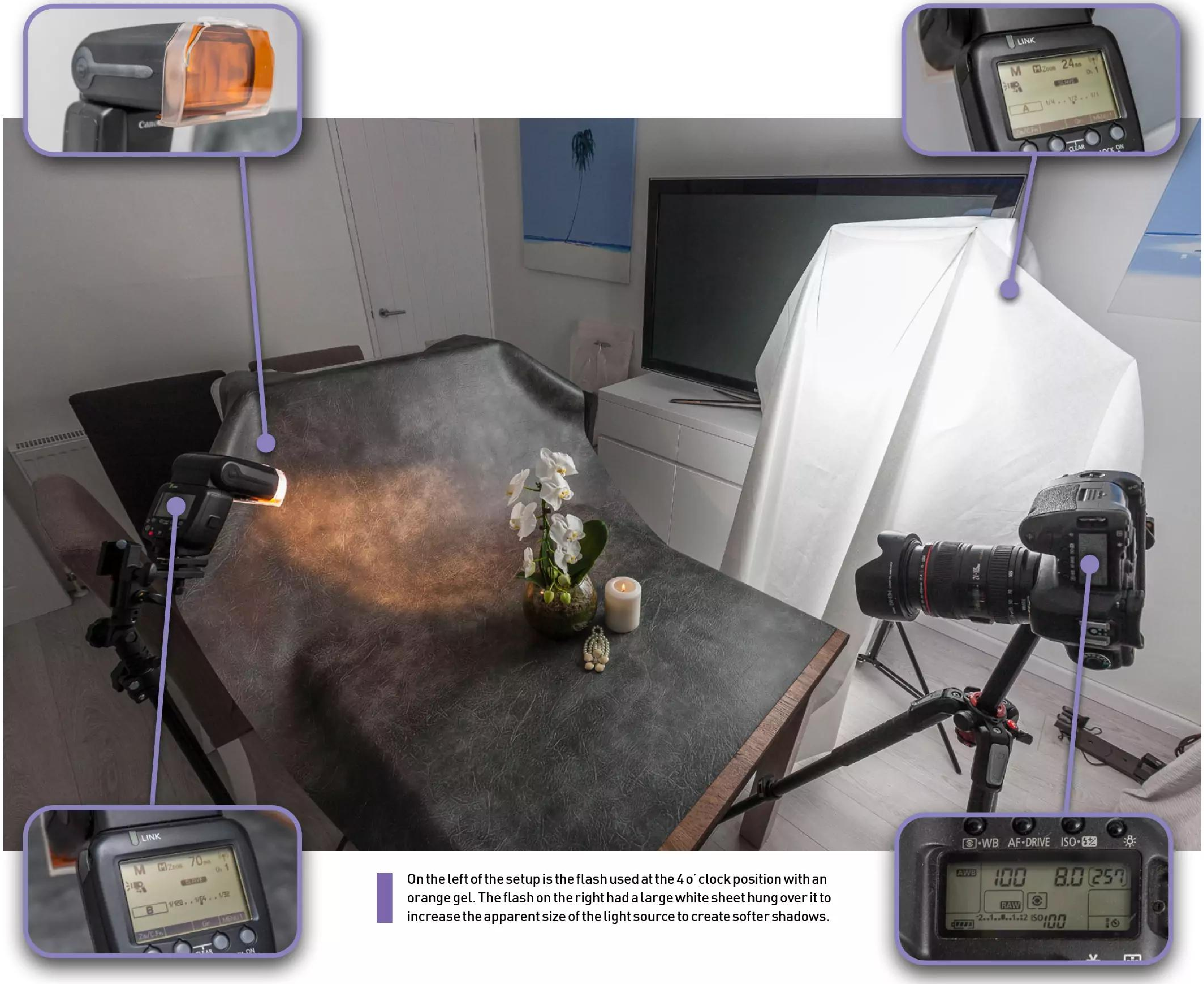
When you have your background and subjects ready, it's time to introduce light. This can be as simple as arranging your scene next to a window on an overcast day and using the soft natural light. If that is not an option, then there is no reason you couldn't employ a couple of desk lamps as your primary light sources. Bounce the light of a nearby wall or piece of white card to create a much larger softbox effect to reduce the appearance of harsh shadows due to small light sources, or place the lamp a distance behind a white sheet and turn the sheet into your light source. Some white card can also be used as reflectors to bounce a little light back into the scene to reduce the depth of the shadows.



A simple grey faux leather fabric creates a great backdrop for your still life composition.



Although our final set up uses flash lighting, you can use desk lamps, torches and household lighting such as this bedside lamp shown on the left and still get a great result as seen in the main picture above.



On the left of the setup is the flash used at the 4 o' clock position with an orange gel. The flash on the right had a large white sheet hung over it to increase the apparent size of the light source to create softer shadows.

Getting in the mood

In our example, we were going for a moodier look. Something that looks more like an old 17th century oil painting. In fact, a Google search for 17th century still life paintings will provide you with many inspirational references where you can study how they chose to capture the light in their scene. Our example was set up on the dining room table with curtains drawn to subdue the ambient light, it was the closest we could get to having the room blacked out. A local fabrics shop had a couple of interesting leather-effect sheets you could buy off the roll. We had a meter each of a grey and a brown textured material, ideal for our backdrops.

Lights and camera

We were working with two wirelessly controlled flashes as our primary sources of light. The camera was set up on tripod to avoid camera shake, and a favourite 24-105mm f/4 lens gave us ample compositional and framing scope of our first subject on the grey material which was a house-warming gift, plus a candle and a piece of jewellery. The subjects were arranged and the lights were set. The process began to dial in both camera settings and the power required of the flashes to light the scene.

Settings

We ended up with one flash at 1/2 power shooting through a large white sheet to mimic a window and the second at 1/64 power with an orange gel placed over the flash to cast a warm glow across the back of the scene. The camera was set at a shutter speed of 1/100th of a second, an aperture of f/8.0 and ISO 100. We would have chosen a shutter speed at the camera's x-sync speed of 1/160th of second, but the camera was an older Canon 5DMK2 and the wireless controller was designed for newer Canon cameras such as the 5DMK3 and the 7DMK2. As such, the controller limits how close you can get to the top x-sync speed and will not let you use high-speed sync at all, which is a shame. However, the settings we had were fine for our set up so we could get shooting.

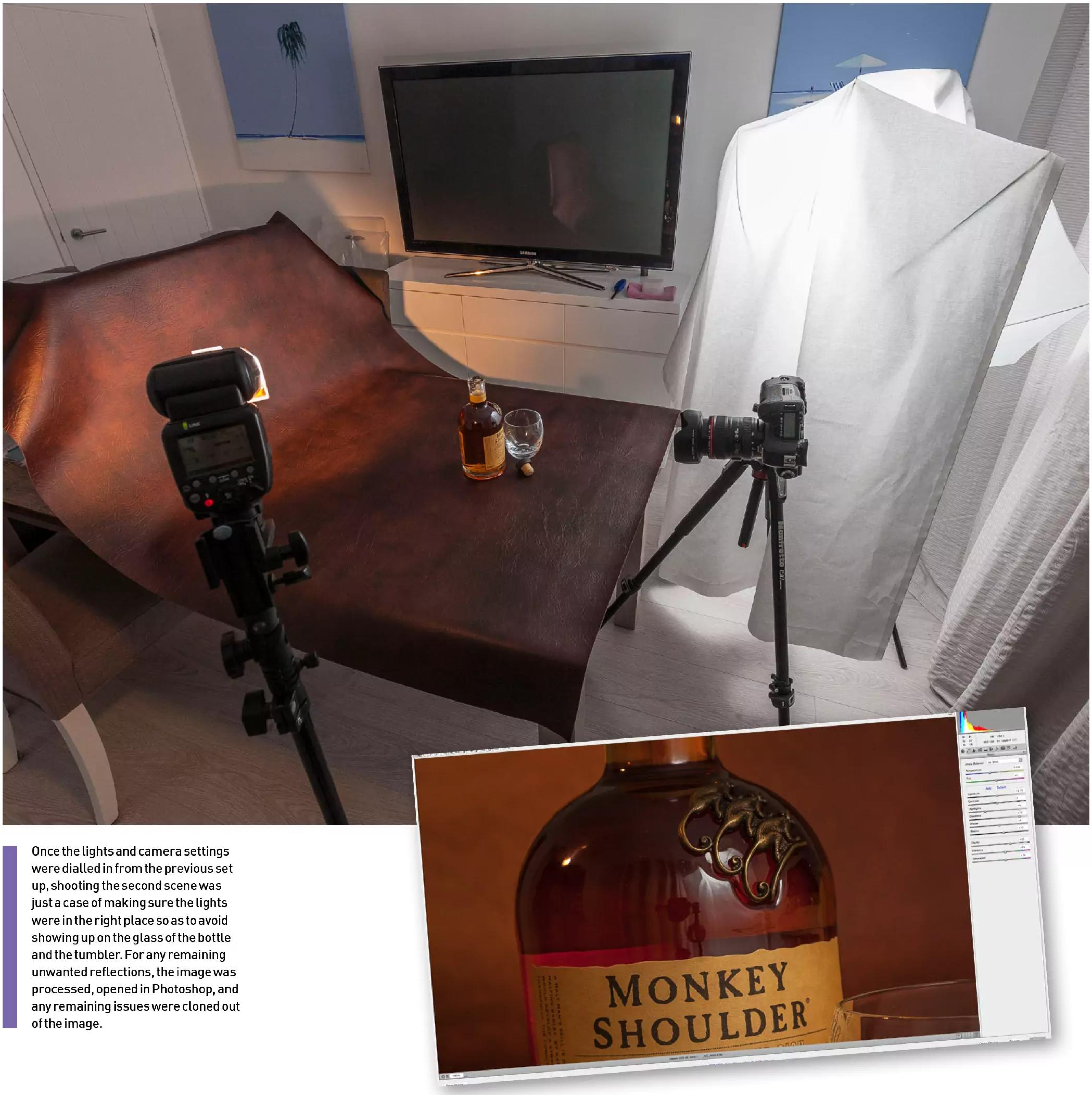
Shooting the first scene

We shot a few frames, tweaked the position of both lights. If you imagine the camera is at the 6 o'clock position, the main flash with the white sheet over it was at the 4 o'clock position and the flash with the orange gel was at the 10 o'clock position, aimed at the grey leather-effect background. This created some nice shadows across the scene and in the petals of the flowers. Try to avoid front-on lighting as it has a tendency to flatten objects out. Shadows help create a sense of depth and give a more 3D quality to your image. The final thing to do was light the candle. Our camera's shutter speed settings were such that enough of the ambient light in the scene could still show up in the shot, so the brightness of the candle flame was not lost each time the flashes fired. A small amount of smoke from the lit candle also showed up very well in the shot, adding to the scene.

BATCH 27
MONKEY SHOULDER
BATCH 27 SMOOTH AND RICH
BLENDED MALT SCOTCH WHISKY

> “The colours of the bottle and the brown leather complimented each other well, and the orange gel from the second flash added greater warmth to the scene.”

f/8.0 1/100
--
ISO 100



Once the lights and camera settings were dialled in from the previous set up, shooting the second scene was just a case of making sure the lights were in the right place so as to avoid showing up on the glass of the bottle and the tumbler. For any remaining unwanted reflections, the image was processed, opened in Photoshop, and any remaining issues were cloned out of the image.

Next up

Having captured the scene, it was time to set up the next one. This was a subject close to the heart, and liver, of the photographer. We set the brown leather sheet up as we did with the grey one and placed a bottle of single malt scotch that had an interesting bottle design, a glass tumbler, and the cork from the bottle in position. Happy with our lights from the first scene, we could use the same settings as before and just frame the shot as desired. A few test shots and some light position tweaks, we could finish preparing the scene. Some cool spherical ice cubes were placed in the glass, and scotch was poured into the glass from a beaker. The colours of the bottle and the brown leather complimented each other well, and the orange gel from the second flash added greater warmth to the scene. The scene was set and we could shoot. As we mentioned earlier, watch out if using shiny surfaces in your shoot. Be aware of what reflections are appearing in your objects. We used a little positional sleight of hand to make sure most unwanted reflections of the camera and tripod were hidden by the bottle label.

Post processing

All that remained was to download the shots and pick out the favourite one from the shoot. The processing was fairly straightforward. We added sharpening, some saturation, and also a dark vignette to make the edges of the shot darker to add the mood we were seeking to create and we were done. Why not try your hand at still life photography? Whether ‘found’ or ‘created’, still life is a very good exercise in arrangement, composition, and lighting skills, and well worth a go. ■

Avoid common photography mishaps

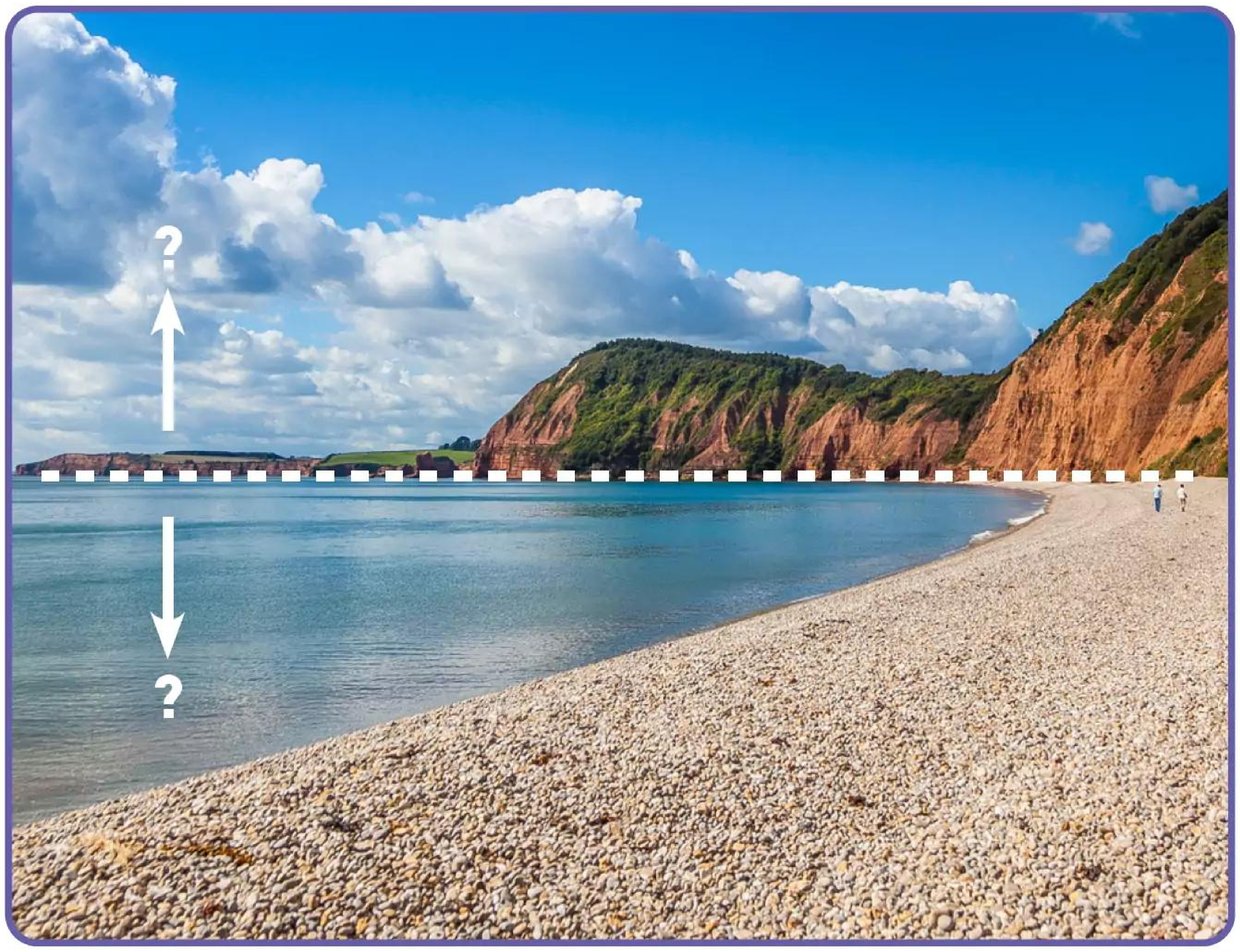
Some guidance on how you can improve your photos

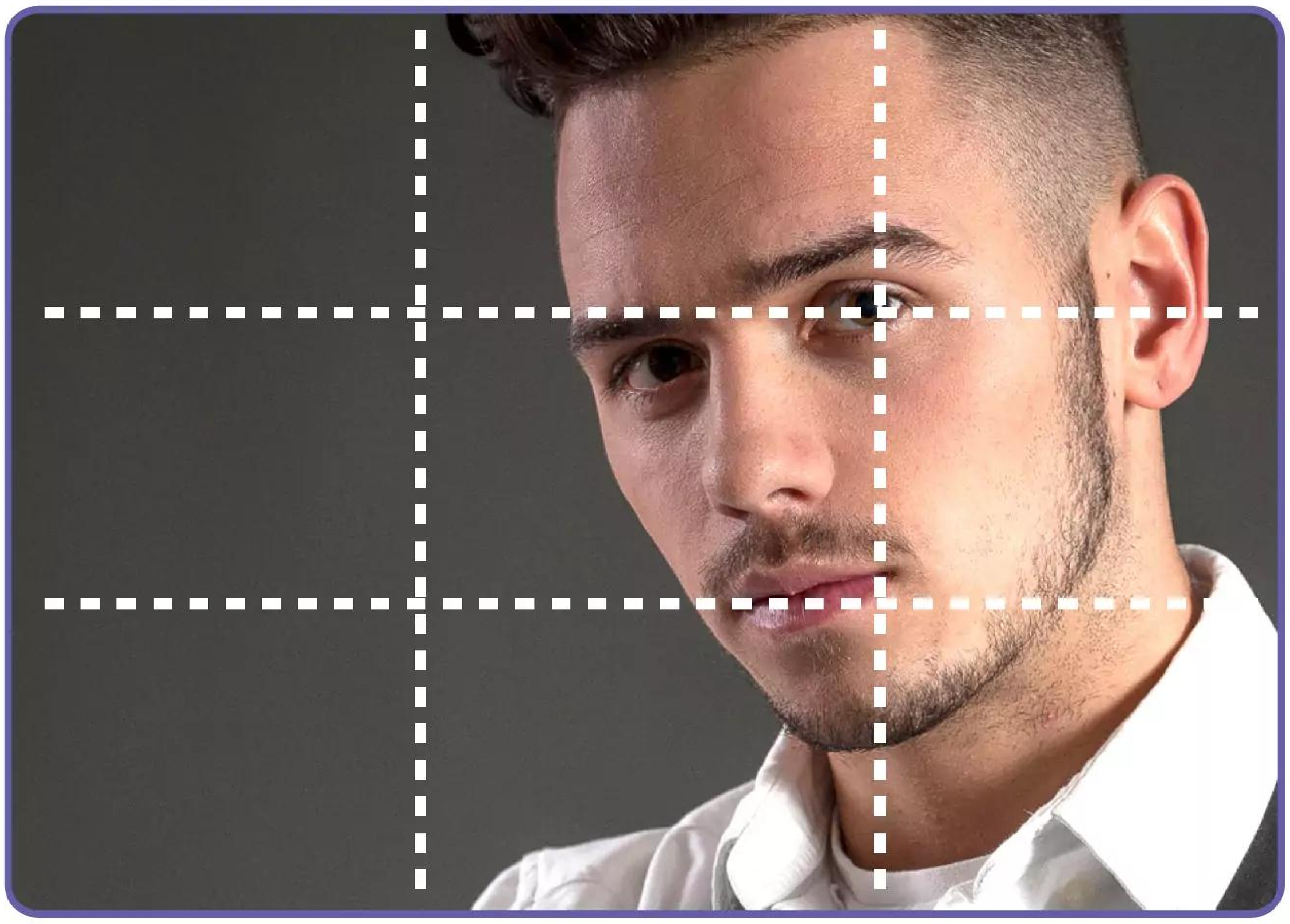
Are you a new photographer? Have you just upgraded to a DSLR from your cameraphone and looking to take more inspired photos? We all have to start somewhere and chances are you're not going to be creating sensational photographic works of art the moment you turn your new camera on. Despite professional photographers wanting us to believe it, they are not all born perfect master of their art. Mistakes happen, lessons have to be learned and experience has to be gained. It is also probably worth noting that you don't have to be a newbie to make mistakes, anyone can do it. You are not alone. Sometimes, things happen that are not even necessarily mistakes. New photographers can get overwhelmed by all the new settings they have to employ to get a good exposure and get a little flustered and in some extreme cases, decide not to pick up a camera again. Now that would be a mistake! Let's run down some of the things that you should be aware of and hopefully your images will improve.

> "New photographers can get overwhelmed by all the new settings they have to employ to get a good exposure."

Stuck in the middle

New photographers may find themselves making this first error quite a bit. It concerns landscape photography generally. There is often the urge to take a landscape shot and place the horizon line right in the middle of the frame. This will divide the image in half horizontally. At first it might actually feel like the natural thing to do but the viewer of the image is left wondering which half of the image is the point of interest. Placing the horizon line on the lower third of the photo makes more of the sky visible and this guides the viewer to scan the sky. If you place the horizon line at the top third of the image, then it is more obvious that the ground is the subject since more of it is on show. Dividing the image up into thirds horizontally and vertically, and placing key subjects in your photo on the points where they intersect or on any of the dividing lines, is an age old guide for composition known as the rule of thirds. It is one of the things that you will get to hear about more as you progress as a photographer. One thing to note about 'guides' and 'rules' is that they are just that. They are suggestions, not necessarily cast in stone. If you, the photographer, want to break the rules, then go ahead and break them; take the photos that make you happy.



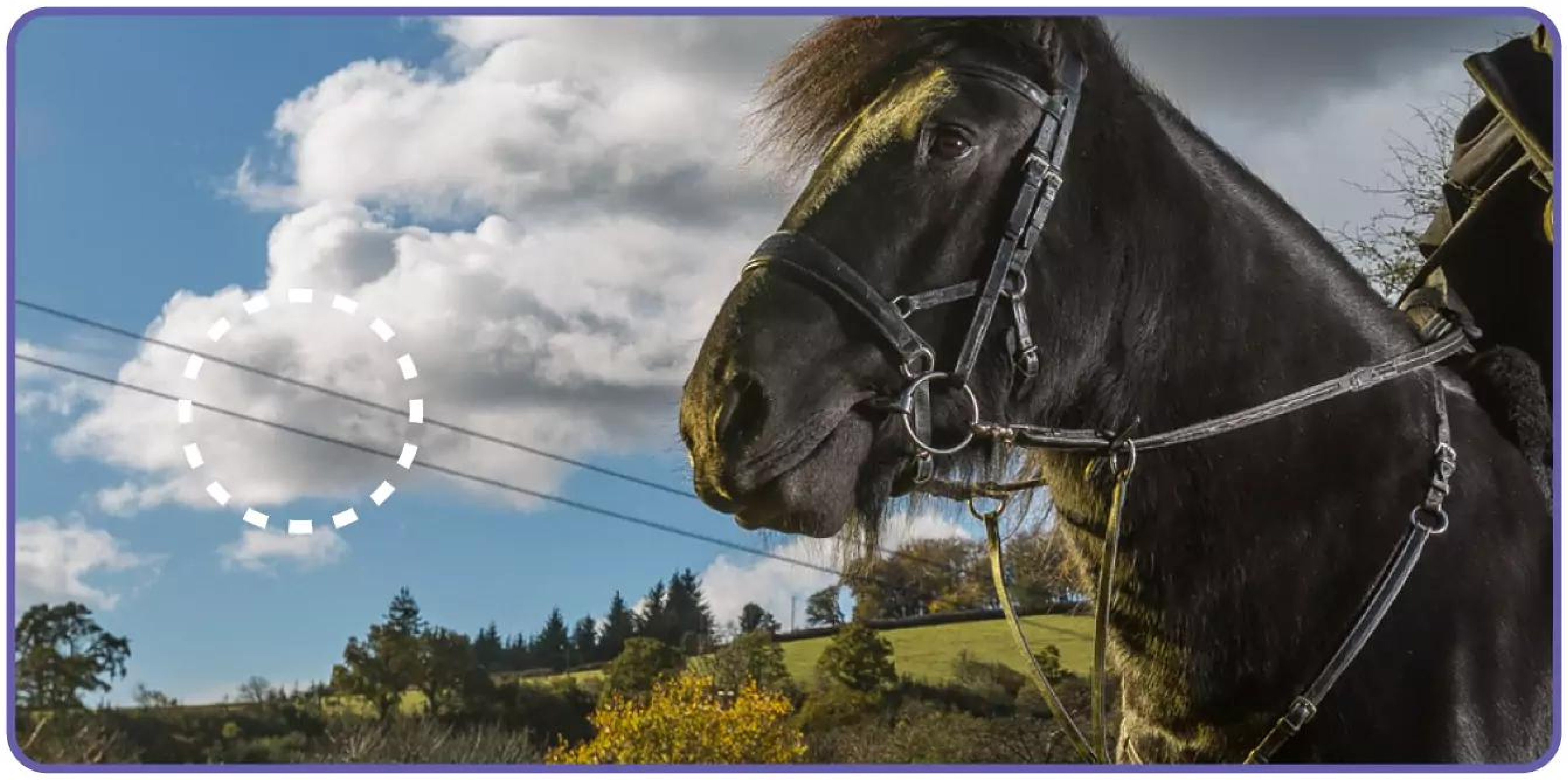


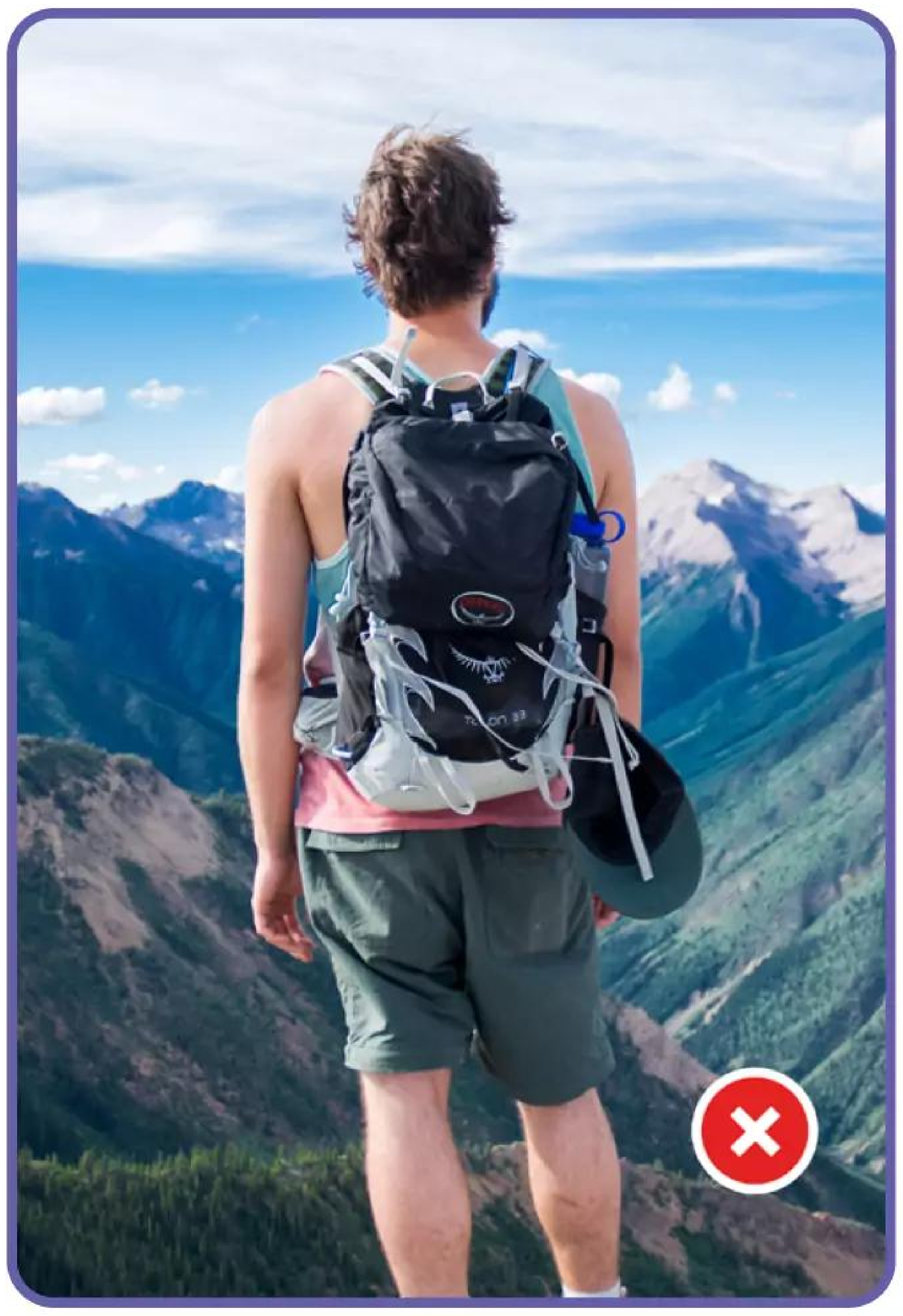
Vertical positioning

If placing your landscape photo's horizon line on either the top or bottom third of the frame is regarded as good form for landscape photos, then shooting portraits has its own suggestion for creating balanced compositions too. Much like shooting a landscape, the chances are that if you have shot someone's portrait, you may have placed them in the middle of the frame. This is not so much of a problem if you have taken a photo of them with the camera in portrait orientation and framed them quite tight for a head and shoulders portrait. If you are trying a landscape orientation photo it is often a good idea to place your subject on one of the vertical third lines. This will place them off-centre to the right or left depending on which line you use. Conventional wisdom tells us that this is a better composition but you, the photographer, have the right to disagree with this if you choose. Bear in mind that there is also the direction your subject is looking that may dictate which side of the frame they are placed. The general rule of thumb is to place them in the frame in such a way that they are looking into the space on the other side of the shot. You can experiment with this to see if it works for you.

Diverting attention

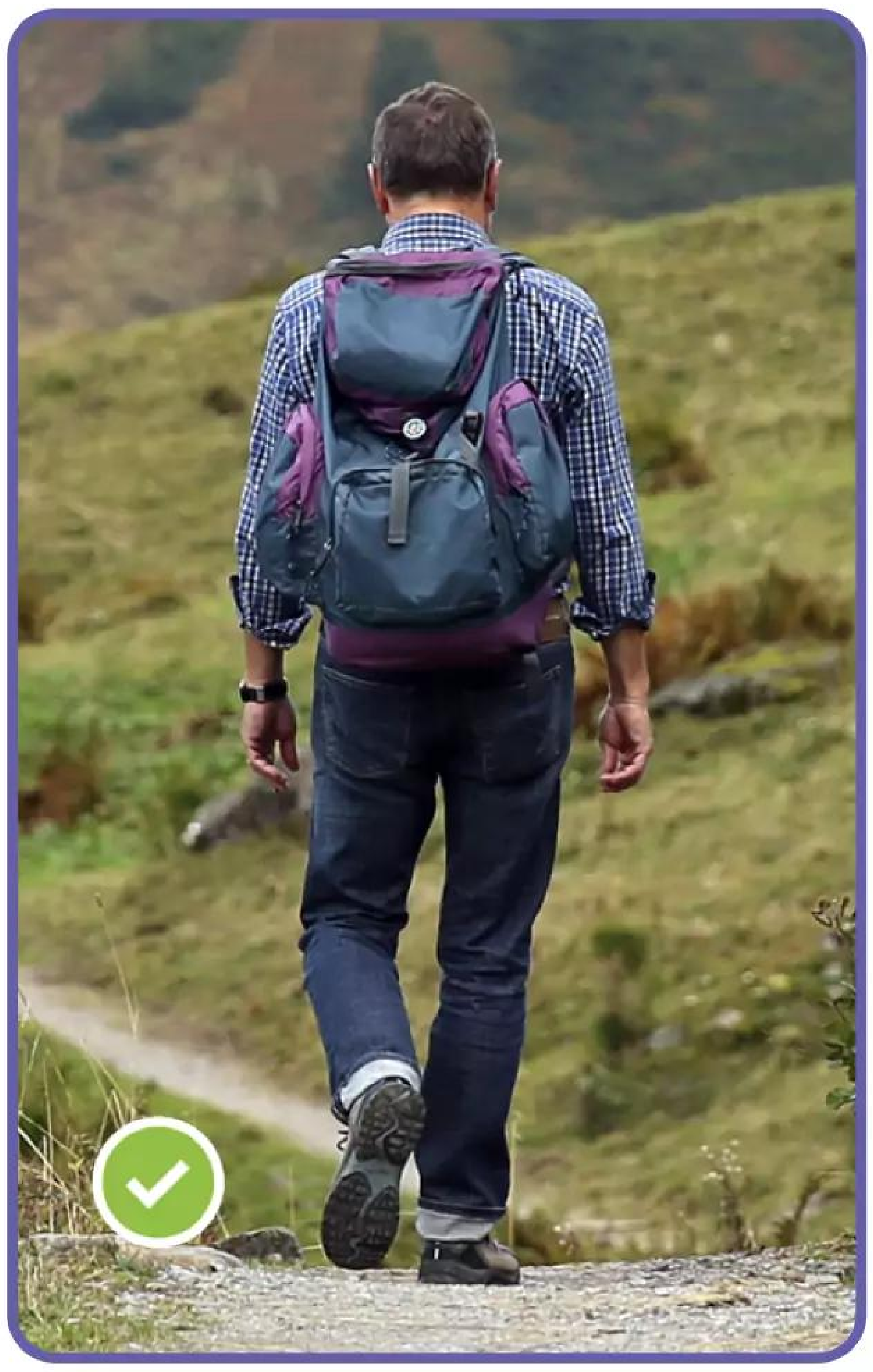
This can often be a classic error perpetrated by many photographers of different skill levels. In many cases, it can be that you just didn't see that telephone line running through the back of the shot or the lamppost that is sticking out of the top of your subject's head. Often, you can be so absorbed in framing your subject, that you miss those subtle but annoying background diversions that can ruin the shot. Yes, get your subject composed in a way that pleases you, but also take a moment to look around the frame of your composition through your camera viewfinder or live view monitor screen. Is there anything that diverts attention away from your subject (and not in a good way)? Can you reframe the shot to remove those distractions from the photo? If so, do it.





Slice and dice

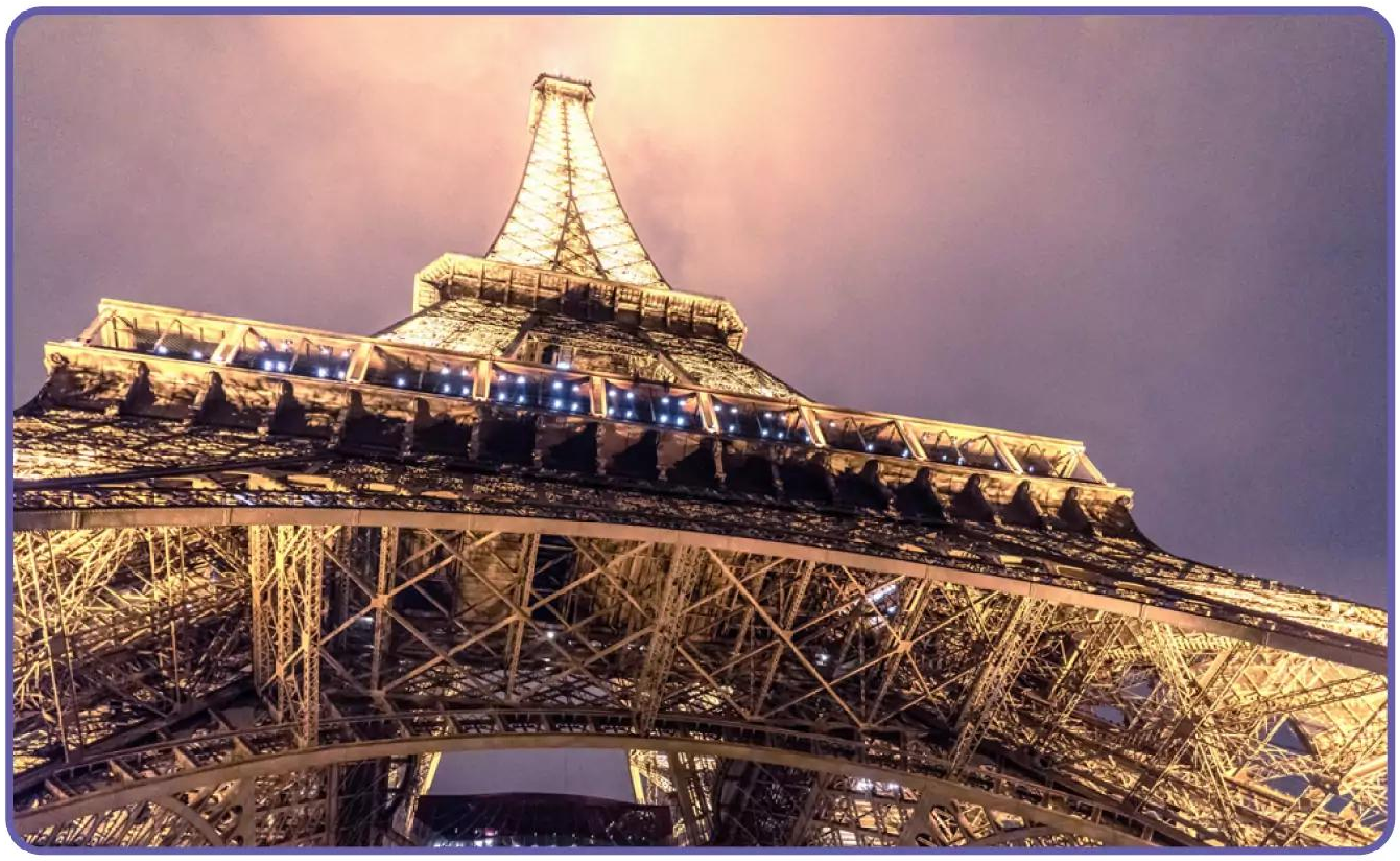
Cutting parts of your subjects off in a photo is another thing that a lot of us have been guilty of doing in the past. In many cases, it is the removal of feet that is a typical thing to do. If not feet, it can often be the top of someone's head or a hand near the edge of the frame. It isn't restricted to portrait photos, it can happen in general landscapes as well. Shooting an interesting church and lopping off the church's spire or removing the top of a tree in a landscape is common. Of course, it may be that your lens isn't wide enough to capture the entire scene from that particular position. You may have the option to move further away, if you have room, and reframe the shot. If not, then you have to make some decisions that include the deliberate cropping of your subject. If you slice off a small amount off a subject it can sometimes look like an accident and you weren't paying attention to the crop. If you deliberately crop much tighter, it can then look much more deliberate and a creative choice on behalf of the photographer. With people's legs for instance, cropping off less than a third of their leg looks like a bad mishap but cropping off two thirds or more of their leg seems to work.



New camera, better photos

Have we not all been a little bit guilty of lusting after the latest camera tech in the hope it will suddenly transform us into amazing world-class photographers? It is an oversimplification but the camera doesn't take the photos, the photographer does. The latest camera may have a few more pixels, it may be able to shoot a few more frames per second in burst mode and it might have a higher max ISO than your own camera but it is an inanimate object. You have to take the photographs and you need to have good technique to get the best out of your shots. No camera in the world will save you if you can't capture a well-exposed photo. Automatic mode will get you so far but you will need to learn the ropes if you want your shots to be noticed amongst the blizzard of average photos out there. Even humble compact cameras can take great photos. DSLRs that are years old will still be able to take amazing photos if the photographer using it knows their stuff.

Canon
EOS 7D
CANON MACRO LENS



A new angle

You pick up your camera, hold it to your eye and take a photo. Seems pretty straight forward. For many shots, that camera angle is absolutely fine but as time goes by, you will have a library of shots all taken from head height. Don't forget to experiment with different camera angles. Many new photographers can get used to shooting in landscape orientation only and may often just forget that the camera can be turned on its side for taking portrait orientation photos. Another simple one is to drop the camera to the floor and shoot up from a very low angle. This change in perspective can add a great deal of variety to your visual repertoire. Don't be afraid to experiment with new angles. Shoot down from higher vantage points, get your camera on the level of your subject particularly if it is a child or an animal, just keep adding different angles to the mix, even if you end up using the first shot taken at eye level. Next time, that low angle might just be the killer shot you need.

Really use the camera

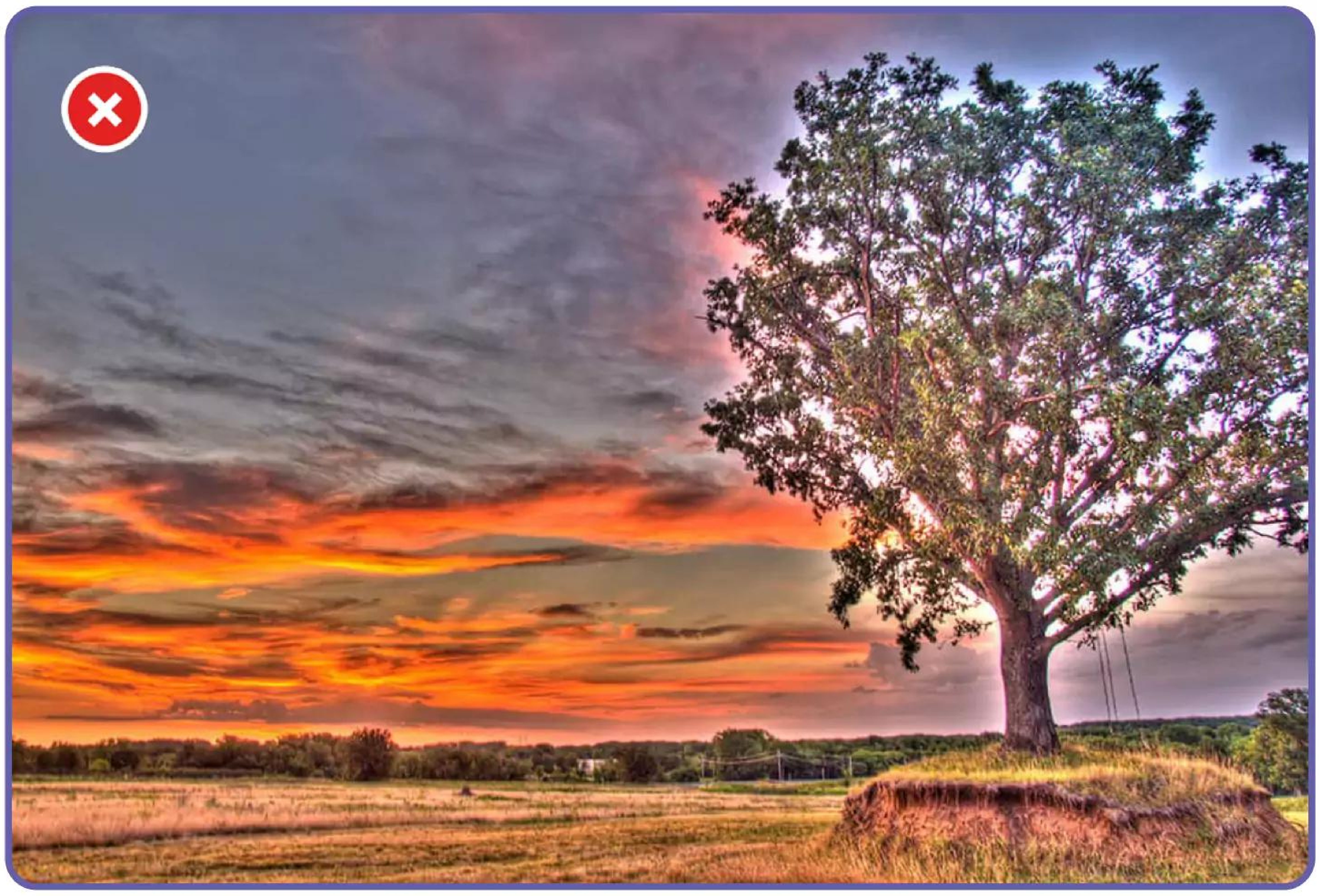
Don't keep the camera on auto. You have an amazing piece of imaging technology in your hands so use it. If you don't know enough about it, then spend the time and learn how to use it. Learn about aperture, shutter speed and ISO and how they all interact with each other and you will not regret it. You will have total control over your images and the camera will not have control over you and the choices you want to make. If you really get a good grasp of the basics, then the whole world of photography really opens up and you will be using the camera to its full potential. You will make some mistakes, we all do. A classic is to set your lens to manual focus for a very particular subject shoot and not switch it back for other shots where autofocus is required. Another is using manual settings for a shot and then shooting with those same settings in a different lighting situation but not looking at the results on your camera's monitor screen.

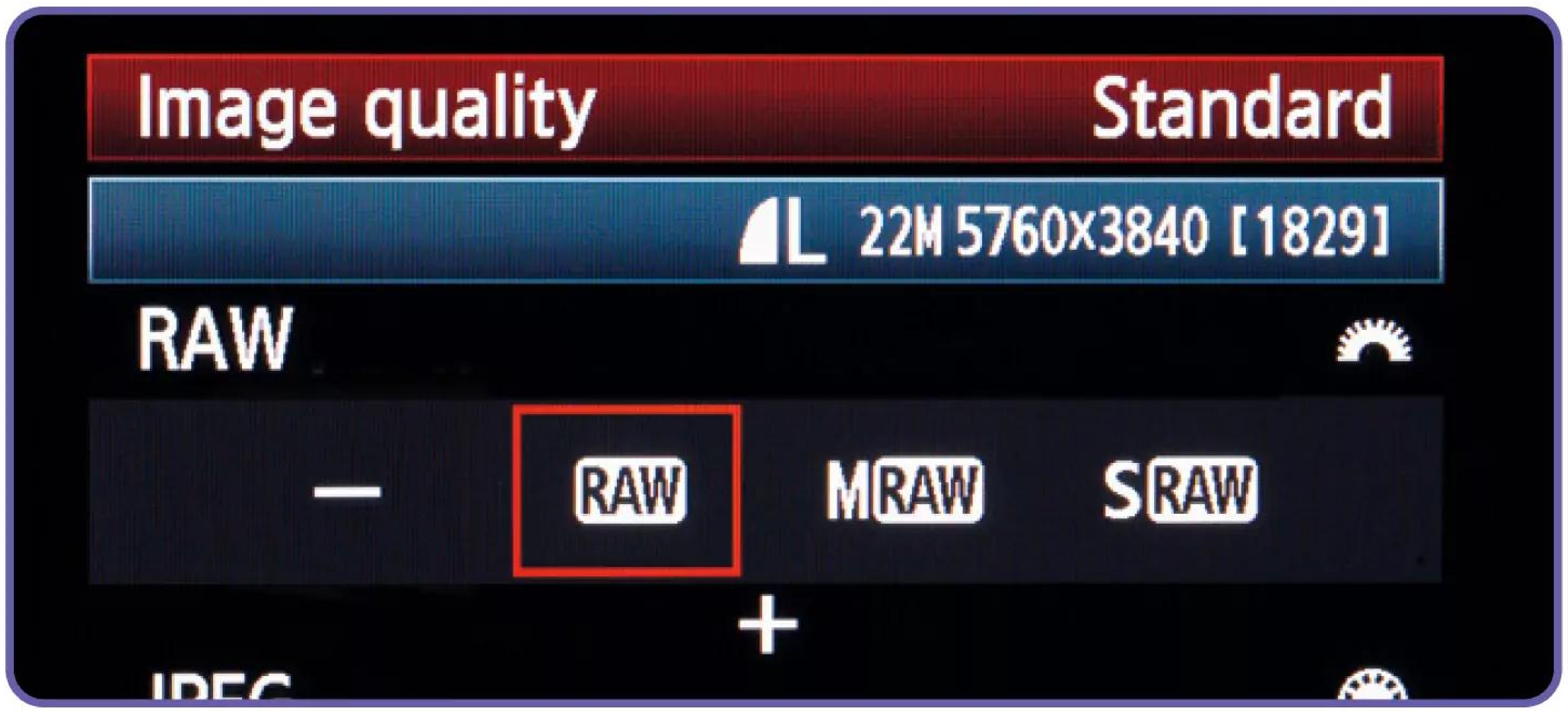
Just ask

A common issue for newbies is not having access to a mentor or another experienced photographer that they can talk to. If you are out shooting at a location where are other photographers around, why not go and have a chat with them? Photographers are a genial bunch and happy to chat about the subject and share insights and help newcomers who are trying to get to grips with their cameras. Think about joining a local photography club. You will be part of a larger group of like-minded enthusiasts who usually plan photo expeditions and go as a group. This is an excellent way to learn the craft. It just requires that you, the photographer, are comfortable enough to go and ask for help and advice when you need it.

Easy on the post-work

This one can separate the newcomers form the pros. Post-work allows you to take that photo and wring every last bit of detail out of the shot to make it the best photo it can possibly be. However, it is also possible to over process the photo and turn it into a lurid over-sharpened version of the original. Take your photo and then, at the post-process stage, add subtlety. Yes, you can add saturation, contrast and sharpness, but learn to see when you've taken it too far. One area that suffers the most abuse is the world of HDR photography. HDR (high dynamic range) photography requires the taking off several photos of the same scene but at different exposures. These are then combined to create images that contain much more tonal range than a single photo. However, those new to HDR can often go so far overboard with the processing that images are created that can give the viewer a migraine at twenty paces; again, subtlety is the key. Try to become another photographer who can save us from too many horrible HDR photos.





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RAW

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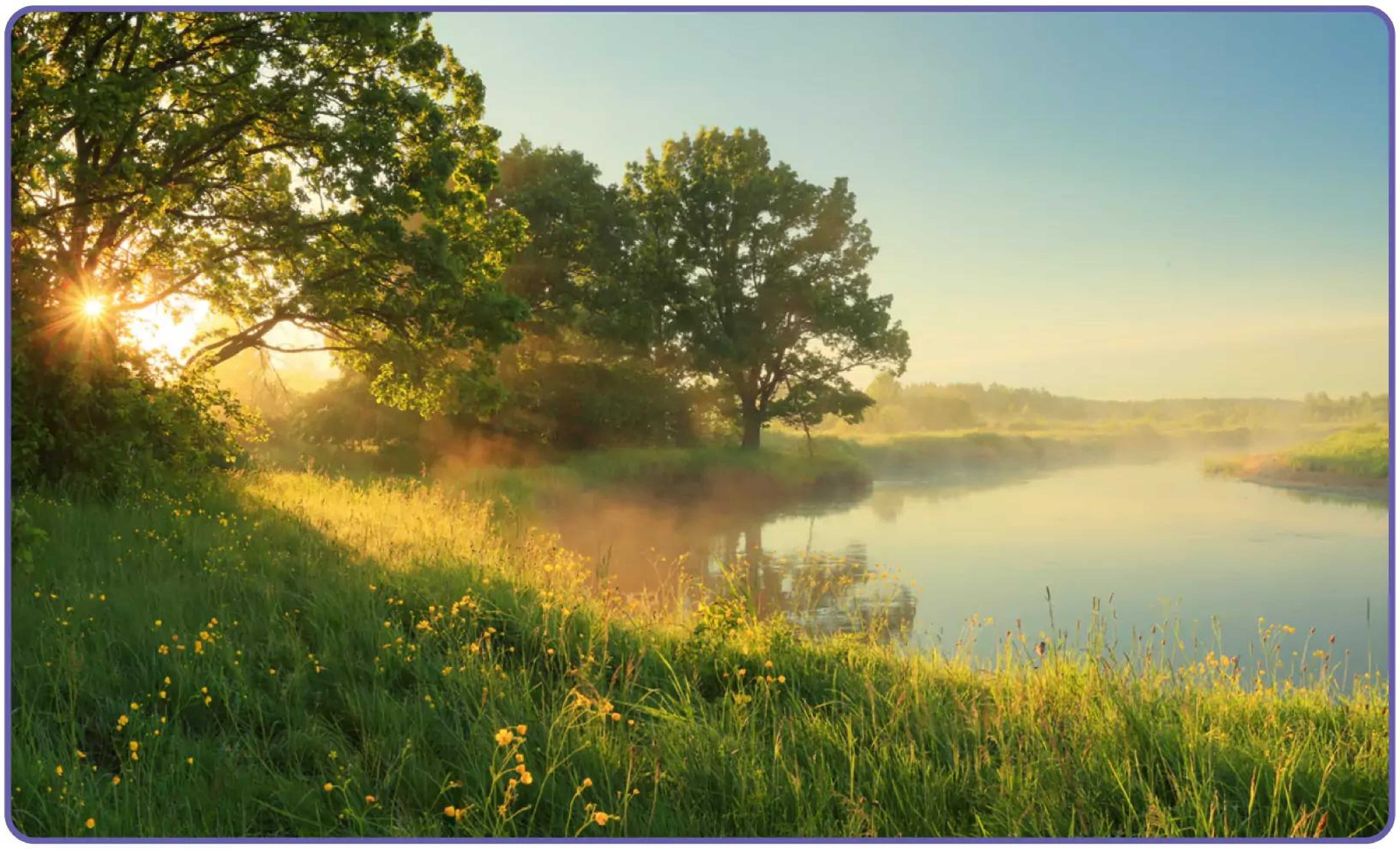
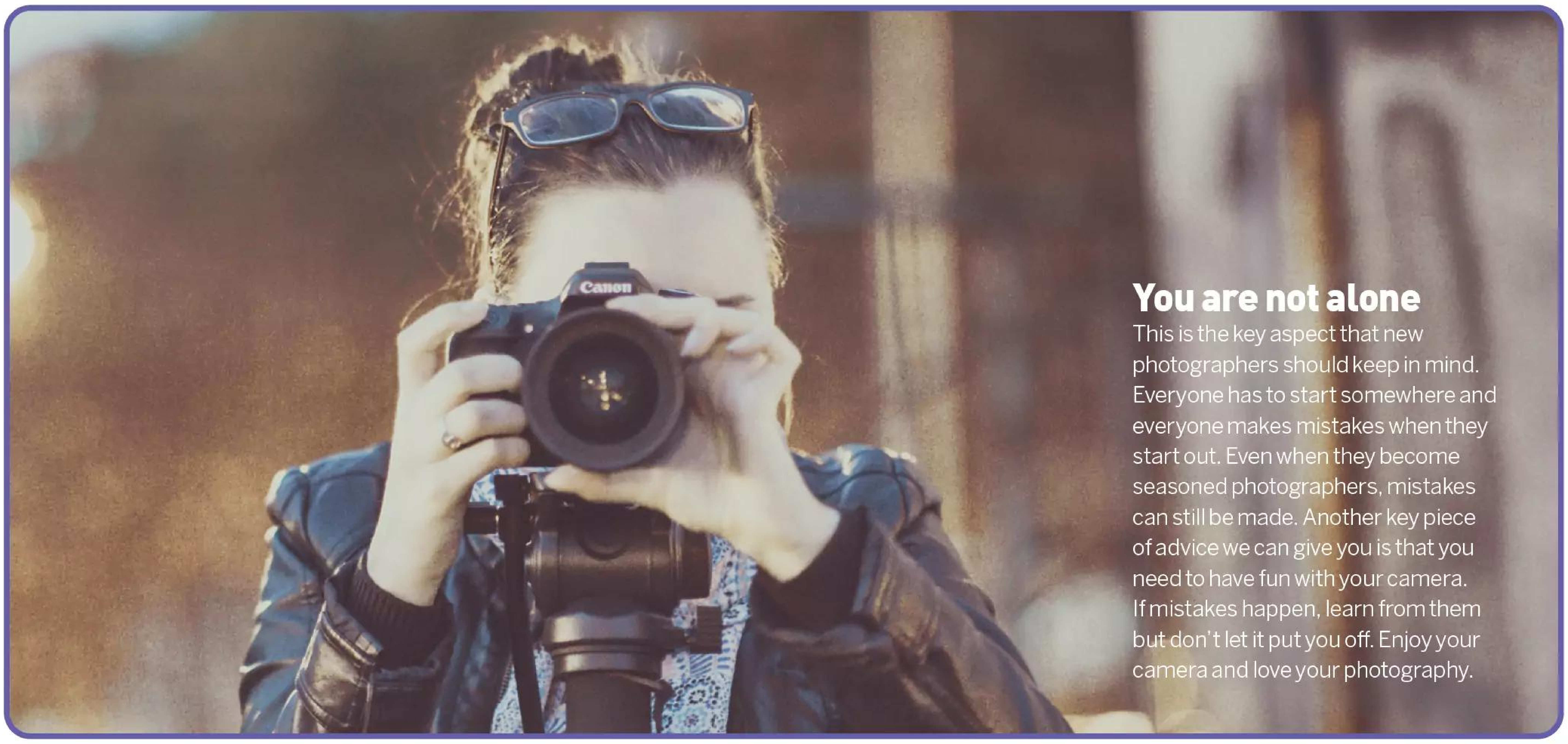
A golden rule

It can't be stressed enough, if you want the best from your shots, you need to switch to Raw shooting mode. This is an important consideration for the new photographer, since many will continue to shoot in jpeg format and never be aware that they can use the Raw format if their camera supports it. Most modern cameras now allow you to capture your images in Raw format. Raw as the name suggests is the uncompressed and unprocessed image data straight from the camera's sensor. The files are much bigger than their jpeg counterpart but they give much greater latitude when it comes to processing your final image.

Light fantastic

In photography you may hear reference to 'the golden hour'. For gorgeous landscapes you cannot do better than to shoot at sunrise and for an hour or so after that; or at sunset and the hour or so before it sets. The light has a luminous warm glow, shadows are long and show off the contours of the land. The sky ignites in pink, orange and red hues and if you catch a sunrise or sunset with an interesting set of cloud formations, then all the better. It may be your creative choice, but try to avoid midday shooting. The shadows at midday are harsh and sit directly beneath objects in the scene. Shadows reveal shape and form, so always think about the time of day you choose to shoot at.



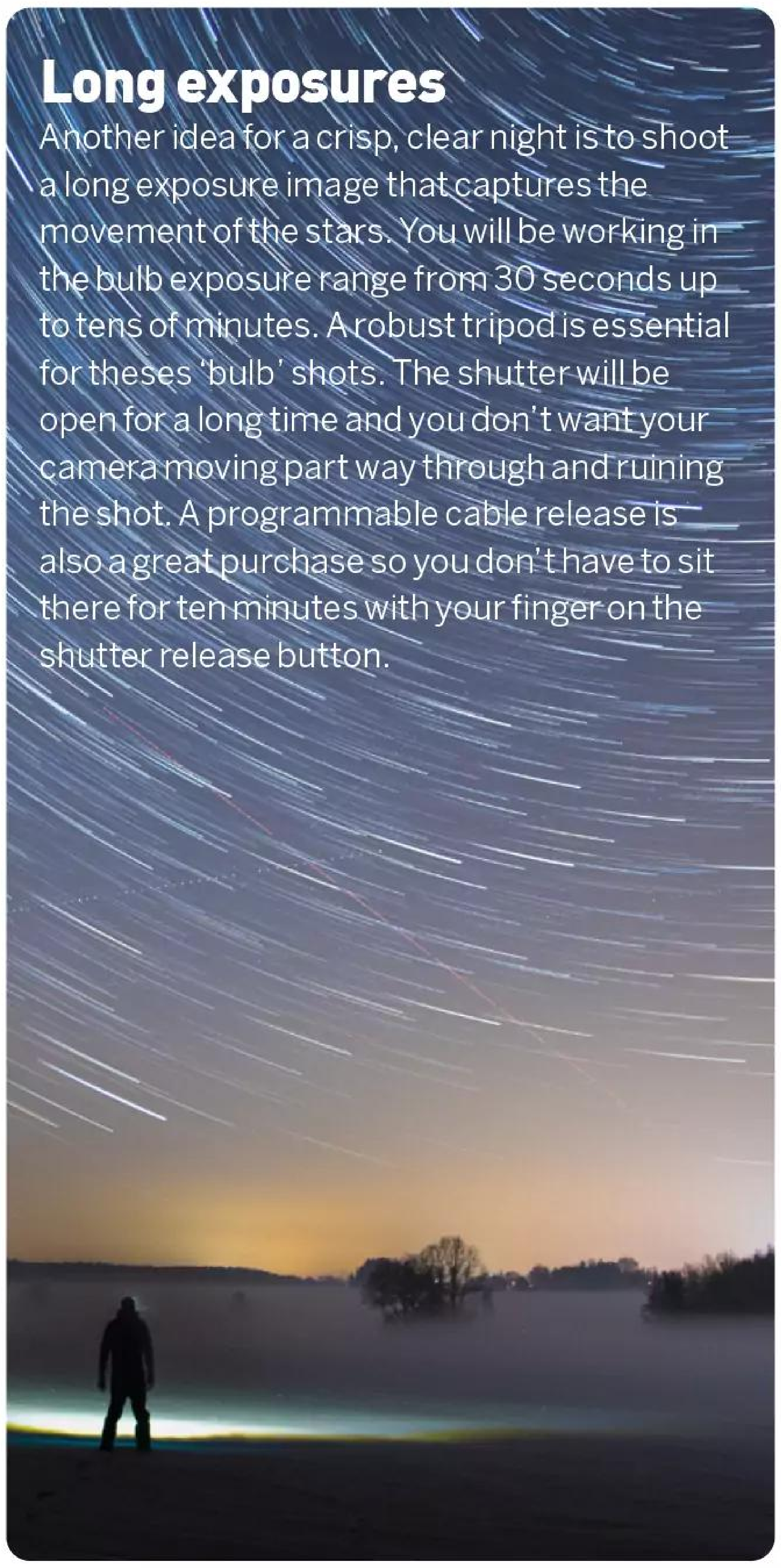


You are not alone

This is the key aspect that new photographers should keep in mind. Everyone has to start somewhere and everyone makes mistakes when they start out. Even when they become seasoned photographers, mistakes can still be made. Another key piece of advice we can give you is that you need to have fun with your camera. If mistakes happen, learn from them but don't let it put you off. Enjoy your camera and love your photography.

City at night

The crisp, clean air of spring can often lead to very clear nights. Take your favourite camera, lens and tripod and go out and shoot some night time urban scenes. If you are looking at capturing a city skyline, you can actually shoot after sunset whilst there is still some light in the sky. This is known as the blue hour and cities look amazing shot against the deep blue of approaching darkness.

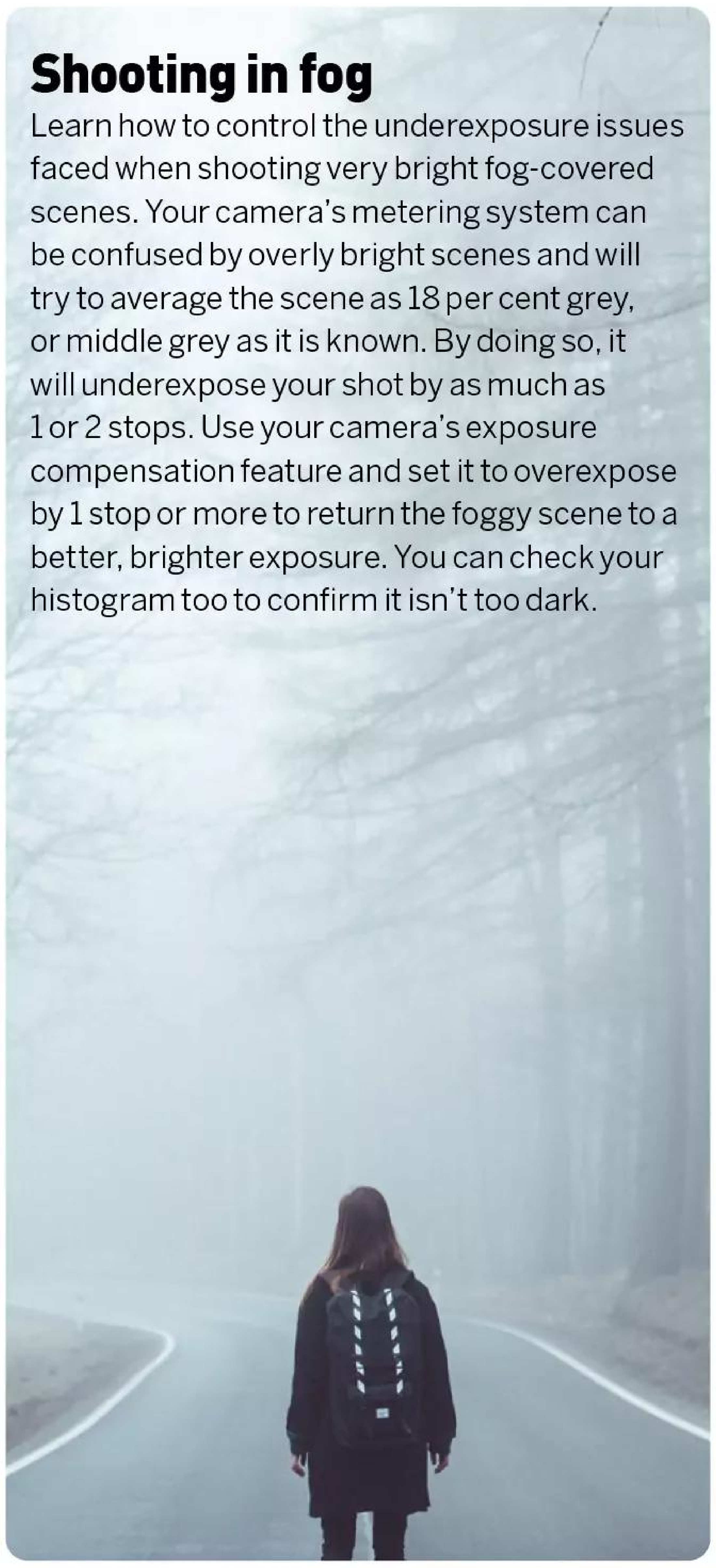


Long exposures

Another idea for a crisp, clear night is to shoot a long exposure image that captures the movement of the stars. You will be working in the bulb exposure range from 30 seconds up to tens of minutes. A robust tripod is essential for theses 'bulb' shots. The shutter will be open for a long time and you don't want your camera moving part way through and ruining the shot. A programmable cable release is also a great purchase so you don't have to sit there for ten minutes with your finger on the shutter release button.

Morning dew

A clear and cold night can make for a lovely dew-covered morning. Make a point of capturing flowers and leaves covered in dew by using a macro lens to get in very close to your subject and reveal their beautiful and delicate patterns. The light of the morning sun, low on the horizon, can be used to illuminate your subjects, casting shadows and causing bright specular highlights on the reflective surfaces and smattering of dew drops.



Shooting in fog

Learn how to control the underexposure issues faced when shooting very bright fog-covered scenes. Your camera's metering system can be confused by overly bright scenes and will try to average the scene as 18 per cent grey, or middle grey as it is known. By doing so, it will underexpose your shot by as much as 1 or 2 stops. Use your camera's exposure compensation feature and set it to overexpose by 1 stop or more to return the foggy scene to a better, brighter exposure. You can check your histogram too to confirm it isn't too dark.

Get composed

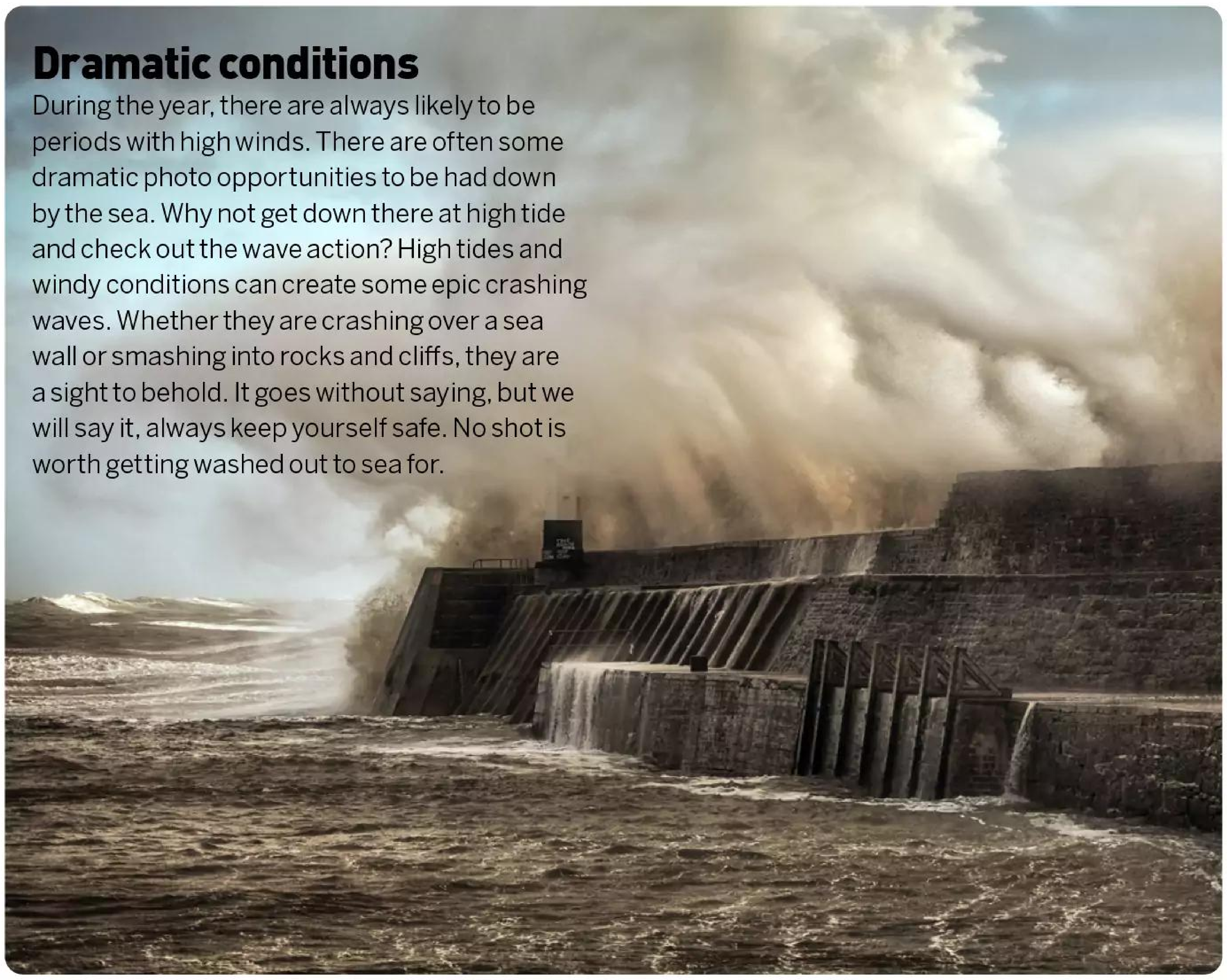
If you and a group of friends are out walking in the woods and three of you are shooting away with your cameras, there is every chance your photos may all look quite similar. You need to set yourself apart from the crowd by thinking about making some bold compositional choices that the others might not have considered. Be brave and don't worry about making mistakes when it comes to your shots. Not every photo you take is meant to set the world on fire with its staggering compositional strength. The shots that don't work should be there as a learning tool for getting it right next time.

Time to graduate

If your skies are full of pale grey clouds, or it is just much brighter than the ground, try using a graduated neutral density (ND) filter to bring some detail back into the sky. Cokin manufacture many filters for landscape work and the ND filter is probably one of the most useful. A 2-stop ND filter for instance, is dark at the top of the filter and gradually fades to clear towards the middle. When placed in front of your camera lens, the top half of the image is darkened by 2-stops and its effect is reduced to zero in the middle.

Dramatic conditions

During the year, there are always likely to be periods with high winds. There are often some dramatic photo opportunities to be had down by the sea. Why not get down there at high tide and check out the wave action? High tides and windy conditions can create some epic crashing waves. Whether they are crashing over a sea wall or smashing into rocks and cliffs, they are a sight to behold. It goes without saying, but we will say it, always keep yourself safe. No shot is worth getting washed out to sea for.

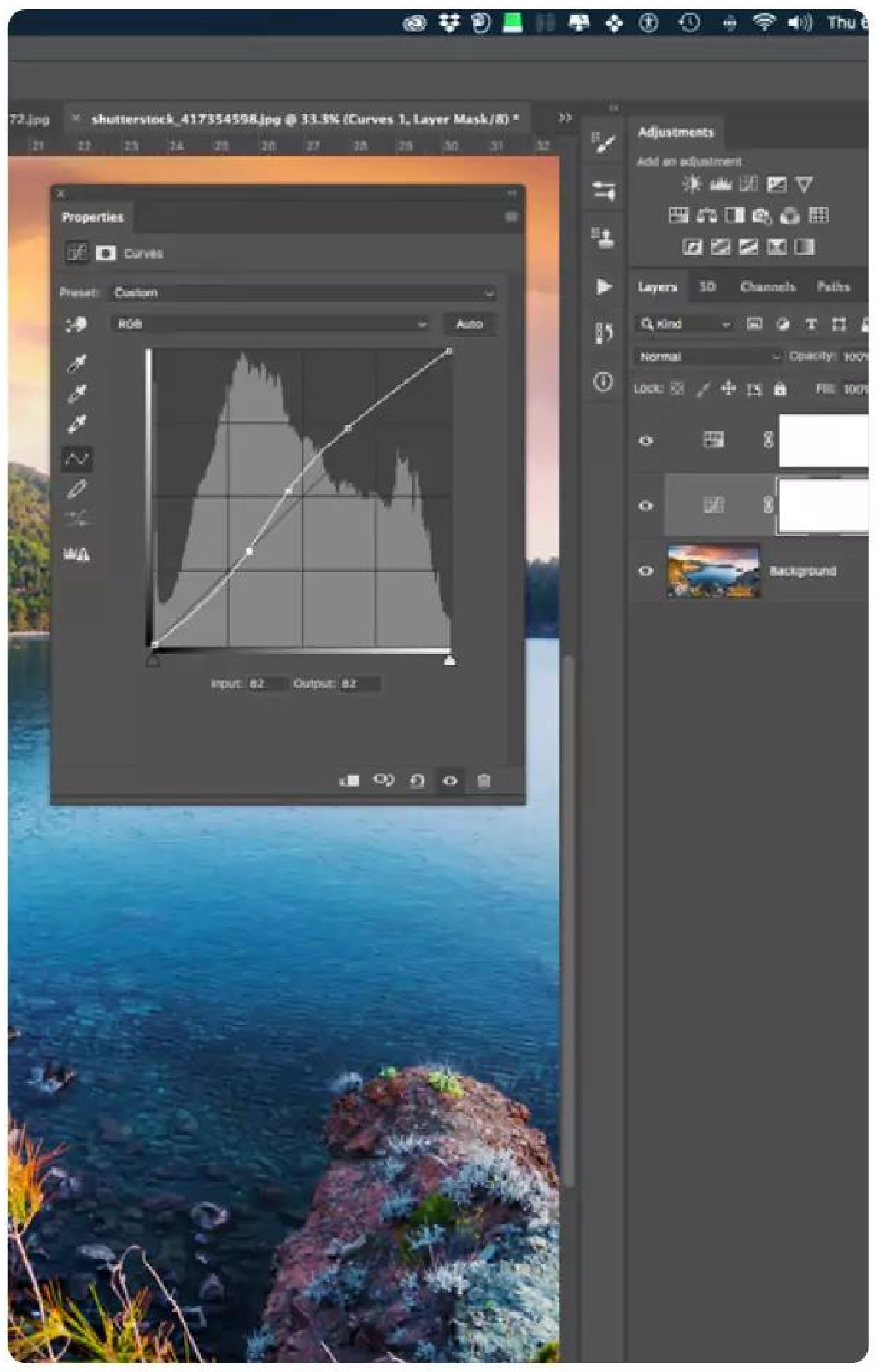


Spring cleaning

Why not spend some time removing unwanted photos from your hard drive and back them up to a portable USB drive. You'd be amazed at how much space you can recover on your computer by pruning out all the unwanted shots you've accumulated over time. We recently totalled up how much space was being taken up on our hard drive with photographs. It came to over 500GB. We reckon that over 80 per cent of the shots weren't being used and that would save an enormous amount of space. Moreover, we did a grand total of everything currently backed up and it came in at over six terabytes!

Photoshop mastery

If you use Photoshop, Elements or Gimp etc., learn one new technique each month that the pros use for improving a photograph, and master it. As an example, Photoshop's use of adjustment layers is critical in eking out every last pixel of detail from a landscape photo. It is also a non-destructive method whereby you do not alter the base image, so you can always go back to the original if you need to. Photoshop cannot make a badly composed, blurry image better or save you from bad technique but it can enhance a good shot and make it a 'wow' shot if done well.



Be safe

If you are thinking of trekking out into the great outdoors, bear in mind that you need to plan your day, wear the appropriate hiking gear and make sure someone knows where you are going. Keep your phone with you and maybe even a GPS tracker. Dressing in layers is important but remember it's better to be too hot than freezing cold. Make sure you have all the gear you need. It would be pretty grim to arrive at an amazing location only to find you've left your memory cards behind, or your favourite wide-angle lens.

Still life

Take the time to photograph still life objects indoors. You can start with something as basic as a sheet of white or coloured paper and a single lamp as your light source. Grab an object, it can be a bowl of fruit (we won't tell anyone, we promise!) or bunch of flowers, and spend time learning how the different positions of a single light affect the look of your still life and the shadows it creates. Then you can use pieces of white card as reflectors and bounce light back into the scene to fill in any dark shadows.

Go mono

Stark landscapes and amazing weather conditions are ideal materials for black and white conversion. Indeed, many photographers like to shoot black and white images on dull days as a lot more detail can be revealed in the image when converted to mono. There are plenty of mono conversion methods you can learn to do in Photoshop. YouTube has countless tutorials that can aid you. We would recommend a third party app called Silver Efex Pro, which is part of the Google Nik collection. It is now completely free and many pros swear by it for their mono conversions.

Glossary

Some terms you may encounter, explained in more detail

AMOLED
Stands for active-matrix organic light-emitting diode. A new type of display technology used in mobile devices and televisions, used in the monitors of some digital cameras. Has several advantages over LCD, including using less power.

Aperture
Behind the lens of your camera is a movable circular iris which opens and closes to control the amount of light falling on the sensor. This is usually controlled by the light meter, although some cameras have a manual aperture control. Altering the aperture also changes the depth of field.

Aperture Priority
This is one of the semi-manual exposure options found on some cameras. The user sets the aperture according to the depth of field they require, and the metering system sets the shutter speed to obtain the correct exposure.

Artefacts
When an image is stored in your camera's memory it has to be compressed to fit, usually into a JPEG file, and in the process some information is inevitably lost. When the image is uncompressed for viewing, noise creeps in and appears as angular blocks in the image, which are known as artefacts.

Autofocus
Almost all digital cameras have automatic focusing. There are essentially two types; contrast detection, used in compact cameras and most CSCs, uses the camera's main sensor and works by detecting the borders between high-contrast areas and trying to make them as sharp as possible. Phase detection AF is used in digital SLRs and some CSCs, and uses a separate sensor. It is usually faster and works better in low light conditions.

AE Lock
Stands for Auto-Exposure Lock, a function found on most advanced digital cameras. This enables you to take a light meter reading from a particular part of the image and then hold that setting while you compose the image. Useful for dealing with back lighting and other difficult lighting situations.

Backlighting
Backlighting occurs when your subject is brightly lit from behind, such as somebody standing in front of a sunlit window. Unless you adjust the exposure to compensate for this, your subject will appear as a dark silhouette against the bright background.

Back-side illumination
Not to be confused with backlighting, this refers to a new method of sensor design. In conventional sensors the wires connecting the photocells of the sensor run over the front surface of the chip, reducing the light-collecting area. Back-side chips are made the other way up, so that the wires are on the back. Offers potentially better low-light performance.

Barrel distortion
Barrel distortion occurs when a wide angle lens distorts an image so that it appears slightly spherical. If you take a seascape with a wide-angle setting and notice that the horizon seems to curve, this is barrel distortion. It's most noticeable when there are straight lines near the edge of the frame. In digital images barrel distortion can be corrected in image-editing software.

Bracketing
Bracketing shots is where a photographer takes the same shot three times or more, each at different exposures. This increases the chance of getting an ideally exposed image. Also, it's possible to combine the shots in software to increase the light and shade within the image, which is essentially how HDR works.

Burst mode
Many cameras offer a burst mode, which means they can take several images in rapid succession, just as you'd get with a motor-wind on a traditional film camera. The number of shots that can be taken is limited by the speed of the camera's image capture and processing systems, as well as the size of the internal memory buffer. You'll typically get about three frames per second from a standard digital camera in burst mode.

Centre-weighted metering
This is when the camera takes an average light reading from the whole frame, but pays more attention to the centre of the image where the subject normally is. This has been largely superseded by multi-pattern metering, which is better able to cope with unusual situations.

CCD
Stands for Charge Coupled Device. This is the light sensor behind the lens of your camera that records the image when you take a photograph. It consists of a grid of millions of tiny light sensors, one for each pixel of the image. The size of a CCD is measured in megapixels, and the higher the megapixel rating, the better the image quality.

Chromatic aberration
Coloured fringes that appear around objects, often toward the edges of the frame. Caused by light rays of different wavelengths coming to focus at different distances from the lens. Better quality lenses seek to minimise this by the use of special coatings and lens designs. Can be corrected by software after the picture is taken.

CMOS
Stands for Complimentary Metal-Oxide Semiconductor. A chip-manufacturing technology used to produce the sensors in an increasingly large proportion of digital cameras. Cheaper but with better tolerance than other methods.

Depth of field
When you focus your camera on a subject, some detail behind and in front of the chosen subject will also be in focus. The distance between the nearest and furthest in-focus objects is known as the depth of field. It is changed by altering the size of the aperture – the smaller the aperture, the larger the depth of field.

Digital zoom
Some cameras give you the option of zooming in on the centre part of an image by expanding it in the camera. Although the zoomed area looks bigger, it still contains the same number of pixels as it did originally, so it will appear blocky and will lack resolution. This is not to be confused with optical zoom, which is far superior.

Dynamic range
The difference between the lightest and darkest areas of an image. If a camera can simultaneously capture shadow and highlight detail then it has good dynamic range. Few cameras can do both but they are improving all the time.

DPI
Stands for Dots Per Inch. The sharpness of an image produced by a printer is defined by how many dots of ink per inch of printed paper its print head can produce. A figure of 1,200dpi or higher is usually required for high quality results, although most modern printers are capable of this.

Effective pixels
Although your digital camera may claim to have 13.6 million pixels on its CCD, some of that number will not be used for taking the picture. Usually, some pixels around the edge of the sensor are painted black to provide a colour balance, while others fall outside the range of the lens.

Electronic viewfinder
Some cameras have a viewfinder containing a miniature LCD monitor showing you what the camera sees. This usually uses less battery power than the LCD screen on the back of the camera, but can be a strain on the eye and difficult to focus.

Exposure
When you take a picture, the camera determines how long the shutter should be open for and how wide the aperture should be, thus obtaining the correct exposure. If a picture is too dark, it is underexposed, whereas if it goes the other way and is too light, it is then referred to as being overexposed.

External flash
This means that the camera has a connection, usually a hot-shoe, that enables you to use a flashgun other than the one built into the camera. This allows a lot more creative freedom and control over lighting, because the flash can be positioned further away from the camera. This feature is only usually available on more expensive or professional-quality cameras.

EXIF
The Exchangeable Image File (EXIF) format is used by nearly all digital cameras that output pictures as JPEGs. It enables information, such as the GPS co-ordinates, date and time the shot was taken, plus exposure and other camera information, to be stored in the image file alongside the normal picture information.

Fixed focus
Cheaper cameras have fixed-focus lenses, which means they cannot be adjusted. Instead they rely on a very narrow aperture to make everything appear in focus, from a few feet in front of the camera out to infinity. They are fine for snapshots at average distance in good light, but are not so good for creative photographs where focus can be used to produce unusual effects.

Focal length
In brief, this term describes the magnifying power of the camera's lens. The longer the focal length, the greater the magnification. Conversely, the smaller the focal length, the more wide-angle the lens. Most digital camera zoom lenses can vary between short and long focal lengths.

f-number
This is the number which describes the ratio of the aperture of a camera's lens to its focal length. Generally, a higher quality lens will have a smaller f-number, which bizarrely means a wider maximum aperture, and thus more light entering the lens.

HDR
A rather over-used technique whereby several shots at different exposures are combined to produce one image capturing a very wide range of contrast, or dynamic range. Useful for high-contrast lighting and night-time shots, but can be over-used by art students who've just discovered it.

Histogram
A histogram is a graph of brightness. It ranges from black through grey to white along the horizontal axis, while values in the vertical axis represent the number of pixels at the appropriate brightness. It provides a means of checking the exposure of an image. If too many pixels are present at the left-hand side of the histogram, the image is underexposed, while if it's weighted to the right, then it's likely to be overexposed.

Interpolation
Some cameras and image-editing software can increase the size of a digital image by adding extra pixels in between the original ones. They take an

average of the pixels around the new one and attempt to match the colour and brightness to create a seamless image. Some systems give better results than others.

ISO
Stands for International Standards Organisation. In conventional photography, the ISO number is a measure of the light sensitivity of photographic film, and this has been carried over into digital photography as a way of expressing the light sensitivity of the CCD.

Jaggies
'Jaggies' refers to jagged diagonal lines that appear in a low-resolution picture. Pixels are square, so if large pixels are being used to represent a diagonal, you'll be able to see the corners of each, creating a saw-like edge. Anti-aliasing is used to soften jaggies, whereby the software will attempt to calculate 'in-between' shades to blur the line a little and make it look a lot smoother.

JPEG
This file type stands for Joint Photographic Expert Group, and is the most commonly used system of image compression. Using a sliding scale between file size and picture quality, it enables digital cameras and computers to squash a large picture into a small amount of memory. Be careful when compressing files, though, because too much compression will reduce the quality of your image.

Landscape mode
A program exposure option found on many mid-priced cameras, this function automatically selects the best exposure settings for taking landscape photographs, usually a longer shutter speed and the narrowest possible aperture to maximise depth of field. It can also refer to holding the camera horizontally, which is usually preferred for landscape shots.

LCD
Stands for Liquid Crystal Diode, a display technology first developed in the 1970s, and in widespread use today. Most cameras have an LCD monitor screen mounted on the back for viewing photographs. Some also have an LCD electronic viewfinder, and some DSLRs also have a separate LCD data display panel.

L-ion
Stands for Lithium Ion. This is the latest kind of rechargeable battery, superior even to Ni-MH. It can hold more power, and does not suffer from 'memory effect', where a partially charged battery, when recharged, will only register the additional charge rather than its full capacity.

Macro mode
This traditionally refers to a lens that can focus closer than its designated focal length, but these days it is used to describe any facility for taking extreme close-ups.

Manual mode
This is for experienced photographers only. It gives you full control over both aperture and shutter speed, enabling you to experiment with exposure and depth of field. Essential for any creative photography.

Megapixel
Megapixels are a measure of the size and resolution of the pictures that a digital camera can produce. Mega means one million, and in this case a million pixels, or more accurately a million individual light sensors on the camera's CCD. The more megapixels, the better.

Memory card
Most digital cameras store your pictures on removable cards full of computer memory. They come in a variety of sizes and there are several different types, including CompactFlash, SD and MicroSD cards as well as Sony's own Memory Stick format.

Metering system
This is how the camera measures the amount of light being reflected by whatever you are trying to photograph, to determine the correct exposure for that particular scene. There are many different types, including spot metering, multi-pattern metering and centre-weighted metering.

Multi-pattern metering
This is a sophisticated means of determining the correct exposure of a photograph. The camera takes light readings from several different areas of the frame and compares them to its pre-programmed data to determine the right exposure. The idea behind this is that bright light sources, such as the sun or brightly lit windows, won't cause the rest of the image to be underexposed.

Night-time mode
A program exposure mode that compensates for low light by setting the aperture to maximum. This lets the most available light into the camera and gives the fastest possible shutter speed under the circumstances.

Ni-MH
Stands for Nickel-Metal Hydride, a type of rechargeable battery rapidly replacing older Nickel Cadmium (NiCad) batteries. Ni-MH batteries do not suffer from the 'memory effect' which was a problem with older rechargeables, and they can also store a lot more power. This makes them ideal for use in battery-guzzling digital cameras.

Optical zoom
With recent advances in lens manufacturing technology, many digital cameras now have small but powerful optical zoom lenses. This means they can be adjusted to magnify the image (zoom in) or to capture a wide-angle shot (zoom out). Because the image uses the full capabilities of the CCD this is preferable to digital zoom.

Pixel
Short for Picture Element. If you enlarge a picture on your computer, you will see that it is made up of tiny squares of a particular colour and brightness called pixels. A pixel is the basic building block of a digital photograph, and there can be several millions of them in an image. The higher the pixel count, the better the quality of the photograph.

Portrait mode
This is a program exposure mode that optimises the camera for taking classical portrait shots, widening the aperture to minimise the depth of field. This ensures that only the subject is in focus, while the shutter speed is increased to minimise camera shake.

Processor
All digital cameras have an image processor, which takes the data from the sensor and turns it into the finished JPEG image that you see on the screen. A faster processor means larger resolution images can be processed more quickly, improving the camera's performance.

Program exposure
Found on most digital cameras, program exposure is an automatic setting where the camera's metering system selects an appropriate aperture setting and shutter speed in an attempt to get the best exposure and performance out of the lens.

RAW
RAW mode is found on most high-end digital cameras. It is an option which stores the uncompressed raw data from the sensor, which can then be processed on a computer using software such as Adobe Camera Raw, Bibble etc. Raw files contain more information than JPEGs, and take up more memory. Raw is actually not an acronym and so shouldn't be all capitals; it should really be written simply as "raw".

Resolution
The more pixels there are in an image, the sharper that image will be. This is the resolution of the picture, and is usually expressed as two numbers representing the height and width of the image in pixels, such as 3,872 x 2,592. Multiplying these two figures gives you the effective megapixels, in this case 10.03MP.

Shutter
The shutter is a device behind the lens of the camera which is normally closed, but opens for an instant when a picture is taken to allow light into the camera and onto the CCD. The length of time the shutter is open for is determined by the metering system, and is known as the shutter speed.

Shutter lag
This is a problem found on many digital cameras. Because of the way they work, there will often be a slight delay between pressing the button and the camera actually taking the photograph. The latest camera designs have reduced this problem a great deal, so check this when buying a new camera.

Shutter Priority
This is a semi-manual mode that enables the photographer to specify a shutter speed while the camera's metering system sets the aperture for the correct exposure.

SLR
Stands for Single-Lens Reflex. A mirror or prism reflects the light coming in through the lens to the viewfinder, so when you look through it you see exactly what the camera sees.

Spot metering
Found on the more expensive cameras, this metering mode enables the photographer to take a light reading from a small area in the middle of the frame, usually marked in the viewfinder. This is the best way of dealing with difficult lighting conditions such as backlighting, and is normally used in conjunction with auto-exposure lock.

Time lapse
We've all seen films of flowers opening at incredible speed, or the sun and clouds racing across the sky. This super-fast motion technique is called time-lapse photography, whereby a stationary camera takes several successive shots at time intervals of a few seconds, minutes or even hours. The images are then played back rapidly, giving the impression of continuous motion.

VGA
Stands for Video Graphics Array, and refers to an image size of 640 x 480 pixels. This was once the standard size of a computer monitor output, but these days even mobile phones have larger displays. VGA is still sometimes found as an image size mode, particularly in the video recording modes of some cheaper cameras.

White balance
Most modern digital cameras automatically adjust the colour balance of the picture to compensate for any tints in the ambient light, such as sunlight, fluorescent strip lights or normal light bulbs. This is called a white balance, and means you can take a picture indoors without that orange tint you get with a film camera.

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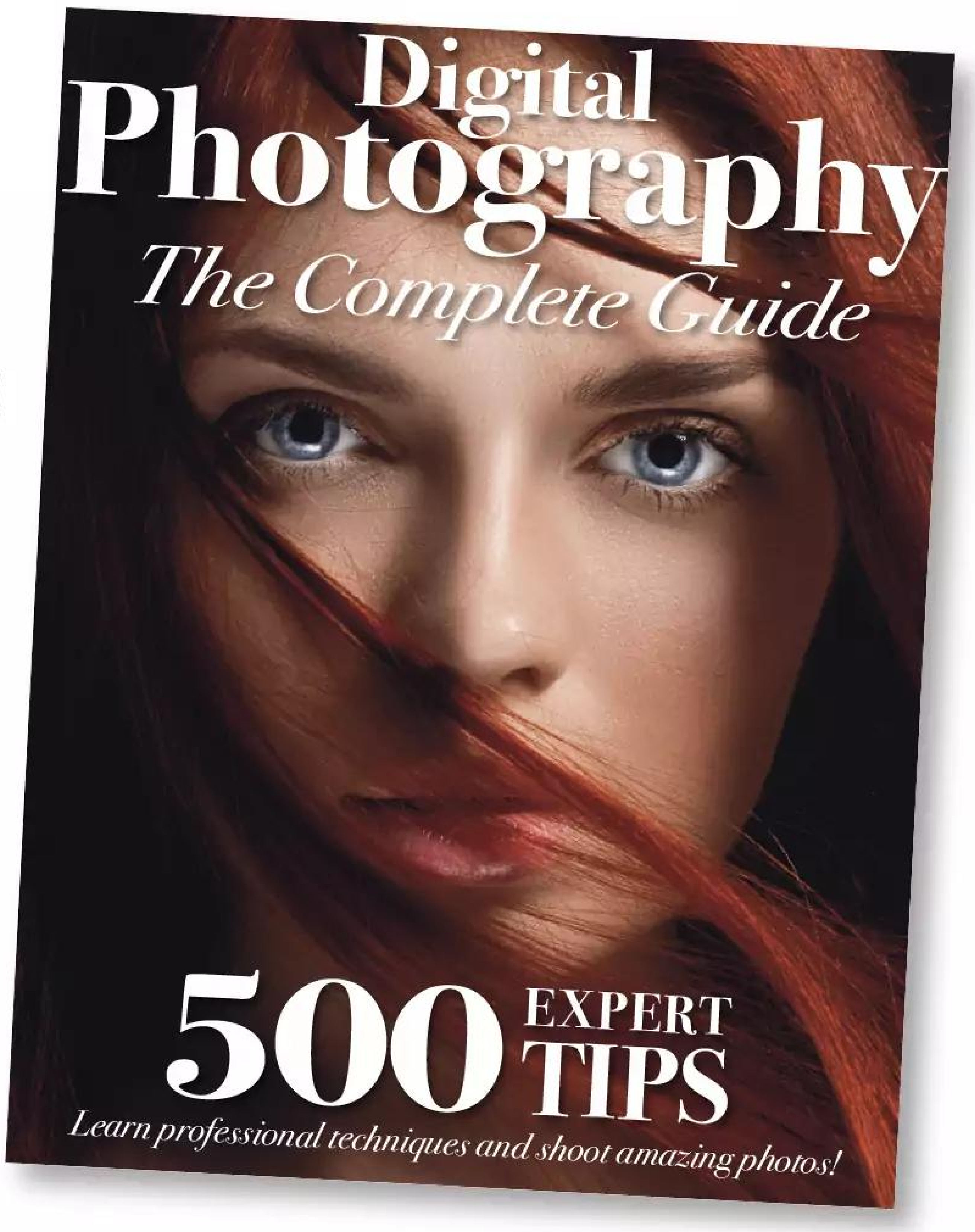
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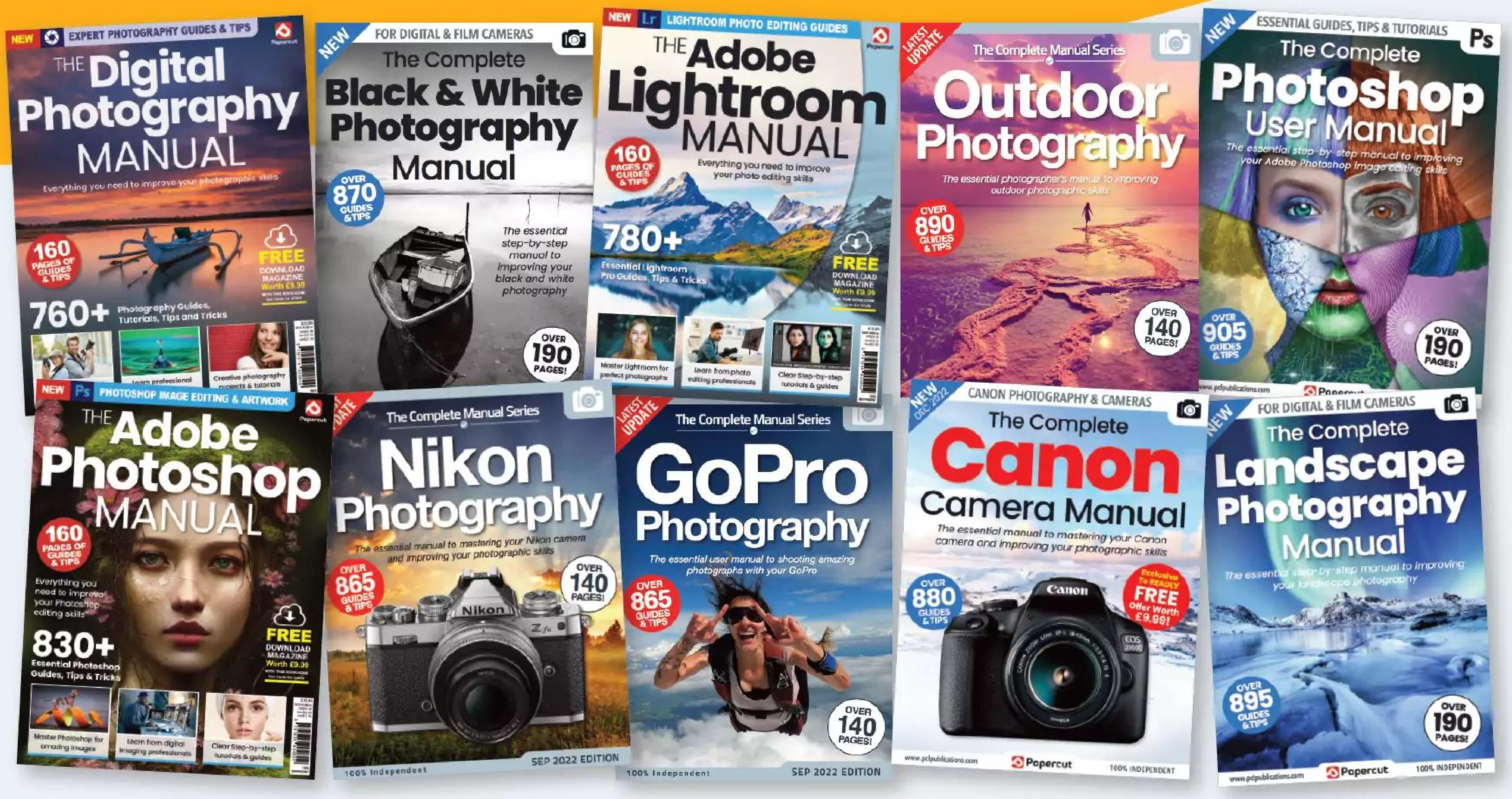

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